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CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE SOUTH PLAINFIELD, NEW JERSEY

OPERABLE UNIT 3: GROUNDWATER

FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

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1. INTRODUCTION

1.1. OVERVIEW

The Cornell-Dubilier Electronics (CDE) Superfund Site (Site) has been divided into four Operable Units (OUs) by the U.S. Environmental Protection Agency (USEPA). Operable Unit 1 (OU1) addresses residential, commercial, and municipal properties in the vicinity of the former CDE facility. On September 30, 2003, the USEPA signed a Record of Decision (ROD) to address OU1. Operable Unit 2 (OU2) addresses contaminated soils and buildings at the former CDE facility. On September 30, 2004, the USEPA signed a ROD to address OU2. Operable Unit 3 (OU3) addresses contaminated groundwater and Operable Unit 4 (OU4) addresses the Bound Brook.

The former CDE facility is located at 333 Hamilton Boulevard, South Plainfield, Middlesex County, New Jersey. The former CDE facility, recently known as the Hamilton Industrial Park, consists of approximately 26 acres. CDE manufactured electronic components including, in particular, capacitors in South Plainfield from 1936 to 1962. Polychlorinated biphenyls (PCBs) and chlorinated organic solvents were used in the manufacturing process. CDE disposed of PCB-contaminated materials and other hazardous substances directly on the facility soils. These activities led to widespread chemical contamination at the facility. Elevated levels of volatile organic chemicals (VOCs) and PCBs have been found in soils at the facility, in soils at adjacent properties (residential, commercial, and municipal), in groundwater beneath the Site, and in the surface water and sediments of Bound Brook.

This Remedial Investigation/Feasibility Study (RI/FS) for OU3 is designed to collect sufficient data to define the nature and extent of groundwater contamination, assess chemical mobility, identify migration pathways, perform an assessment of human health risks, and evaluate potential remedial alternatives for groundwater at the Site. These data will be used to support the selection of remedial alternatives to potentially mitigate or reduce risks in accordance with the requirements of the National Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

1.2. APPROACH TO DEVELOPMENT OF WORK PLAN

This Work Plan presents the proposed technical scope of work and schedule for the performance of the work. The Work Plan has been prepared in accordance with current USEPA guidance including, but not limited to, the following:

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. EPA/540/G89/004. OSWER Directive 9355.3-01 (USEPA, 1988b).
- CERCLA Compliance with Other Laws Manual, Interim Final. EPA/540-9-89-006 (USEPA, 1988a).
- Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-44, EPA/540-R-07-06 (USEPA, 2007).
- Guidance for the Data Quality Objectives Process, EPA QA/G-4, (USEPA, 2000).
- Uniform Federal Policy For Quality Assurance Project Plans, Part 1: UFP-QAPP Manual, EPA-505-B-04-900A, Final Version 1 (USEPA, 2005a).
- Uniform Federal Policy For Quality Assurance Project Plans, Part 2A: UFP-QAPP Workbook, EPA-505-B-04-900C, Final Version 1 (USEPA, 2005b).
- Uniform Federal Policy For Quality Assurance Project Plans, Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities, EPA-505-B-04-900B, Final Version 1 (USEPA, 2005c).

- Guide for Conducting Treatability Studies Under CERCLA, Interim Final. EPA/540/2-89/058 (USEPA 1989a).
- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Part A (USEPA, 1989b).
- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (USEPA, 2001a).
- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (USEPA, 2004).

Preparation of this Work Plan was based upon a review and consideration of data, information, and discussions related to the following:

- Scoping meeting with the U.S. Army Corps of Engineers (USACE) and the USEPA on May 1, 2008.
- Foster Wheeler Environmental Corporation (FWENC), 2001a. Data Evaluation Report for Cornell-Dubilier Electronics Superfund Site.
- FWENC, 2002. Final Remedial Investigation Report for OU-2 On-Site Soils and Buildings.
- Malcolm Pirnie, Inc., 2007. Final Pre-Design Investigation Report for Operable Unit 2 Soils.
- Data collected as part of the OU3 groundwater investigation conducted by the USEPA in January 2008.

1.3. SCOPE OF WORK

The scope of work was outlined in the USACE Scope of Work, transmitted to Malcolm Pirnie, Inc. on December 3, 2007. The Scope of Work identified the following tasks:

- Project Administration – Coordinate and manage all aspects of the work including technical scope of work, schedule, budget, resource staffing, reporting requirements, and subcontractor performance.
- Contractor Quality Control Plan – Prepare a Quality Control Plan (QCP) specific for OU3.
- Project Scoping and Planning – Evaluate existing groundwater data and any additional information provided by the USACE and the USEPA to identify and evaluate data gaps. Following a review of the existing data and identification of data gaps, attend one or more project scoping meetings. After the scoping meeting, prepare a technical memorandum summarizing the results of the groundwater data collected to date and provide a recommendation of additional investigations and studies for the OU3 RI/FS.
- RI/FS Planning Documents – Develop a Work Plan (this document) to meet the objectives of the OU3 RI/FS. The Work Plan shall outline the overall technical approach, proposed field investigation, personnel requirements, and include a project schedule with deliverable milestones and corresponding due dates; in addition, the Work Plan will also contain a Preliminary Human Health Risk Assessment (PHHRA). Included with the Work Plan will also be a Field Sampling Plan (FSP), Site-Specific Safety and Health (SSHP), and a Quality Assurance Project Plan (QAPP).
- Remedial Investigation Work Plan Implementation – Implement the RI (Remedial Investigation) Work Plan upon approval of the planning documents (WP, FSP, QCP, QAPP, and SSHP).
- Sample Analysis and Validation – Develop a data management system including field logs, sample management tracking procedures, and document and inventory controls for laboratory data and field measurements; the data management system will be developed following USEPA Region 2 Field and Analytical Services Teaming Advisory

Committee (FASTAC) procedures in accordance with the Division of Environmental Science and Assessment (DESA) requirements.

- RI and BHHRA Reports – Prepare the RI and Baseline Human Health Risk Assessment (BHHRA) reports; the RI and BHHRA reports are to be separate documents but will follow the same schedule and be submitted concurrently.
- Development and Screening of Remedial Alternatives – Conduct remedial alternatives development and screenings in accordance with USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.
- Detailed Analysis of Alternatives – Conduct a detailed analysis and estimate costs of alternatives consistent with Chapter 6 of the USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.
- Feasibility Study (FS) Report – Present the general response action and preliminary remedial action alternatives in an FS report for OU3. Depending on the selected alternative, a treatability study or pilot test may be conducted to prove the effectiveness of the technology. If appropriate, this work will be performed as part of the detailed analysis of alternatives.
- Post RI/FS Support – Assist the USEPA and the USACE by providing technical expertise and support as needed.

1.4. WORK PLAN CONTENT

This Work Plan is organized into nine sections, including references and a glossary of abbreviations. A brief description of each section follows.

Section 1.0, **INTRODUCTION**, presents an overview of the environmental conditions at the site, the approach used in developing the Work Plan, the scope of work, and the organization and content of the Work Plan.

Section 2.0, **SITE BACKGROUND AND SETTING**, presents the background of the site including location, history, and current conditions.

Section 3.0, **INITIAL EVALUATION**, presents an initial evaluation of the existing database. This section includes a description of the types of waste present, site hydrogeology, climate, population, and environmental resources, migration and exposure pathways, a preliminary identification of applicable or relevant and appropriate requirements (ARARs), the PHHRA, a summary of additional data requirements, and remedial action objectives.

Section 4.0, **WORK PLAN RATIONALE**, includes the Data Quality Objectives (DQOs) for RI sampling and analytical activities, and the approach for preparing the Work Plan, which illustrates how the activities will satisfy data needs.

Section 5.0, **TASK PLANS FOR RI/FS**, presents a proposed scope for each Standard Task of the RI/FS in accordance with the RI/FS guidance documents (USEPA, 1988b).

Section 6.0, **PROJECT SCHEDULE**, presents the anticipated schedule for the RI/FS tasks.

Section 7.0, **PROJECT MANAGEMENT APPROACH**, presents project management considerations that define relationships and responsibilities for selected task and project management teams.

Section 8.0, **REFERENCES**, provides a list of references used to develop material presented in this Work Plan.

Section 9.0, **GLOSSARY OF ABBREVIATIONS**, provides a glossary of abbreviations and acronyms used in this Work Plan.

The SSHP and QAPP (which includes the FSP as an attachment) are included under separate cover.

2. SITE BACKGROUND AND SETTING

2.1. SITE LOCATION

The Site is located in the Borough of South Plainfield, northern Middlesex County, in the central portion of New Jersey. According to the 2006 Census estimate, South Plainfield has a population of approximately 22,795 people with a total land area of approximately 8.4 square miles (city-data.com).

The Site includes a fenced, 26-acre facility that is bounded on the northeast by Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); on the southeast by Bound Brook and a property used by the South Plainfield Department of Public Works; on the southwest, across Spicer Avenue, by single family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties. The surrounding area represents an urban environment with principally commercial and light industrial use to the northeast and east, principally residential development to the south and directly north, and mixed residential and commercial properties to the west. Most recently, the property contained numerous subdivided buildings, numbered 1 through 18. In 2007, EPA began implementing the OU2 ROD with the relocation of the tenants at the industrial park and demolition of the 18 buildings. Relocation of the tenants was completed in mid-2007, and demolition of buildings was completed in May 2008. A topographic map showing the location of the former CDE facility is included as Figure 2-1 and a Plan View of the facility, showing the former buildings, is included as Figure 2-2.

2.2. SITE HISTORY

The history of the Site and previous investigations/enforcement activities that have occurred at the Site are detailed below. Previous investigations have included groundwater sampling, subsurface soil sampling, sediment sampling, building surface sampling, soil gas sampling, indoor air sampling, and hydrogeological studies.

The Spicer Manufacturing Company operated a manufacturing plant on the property from 1912 to the mid to late 1920s. Most of the major structures were erected by 1918; Figure 2-2 shows the locations of the former buildings which were demolished from 2006 to 2008. When the Spicer Manufacturing Company ceased operations at the facility, the property consisted of approximately 210,000 square feet of buildings (FWENC, 2002).

The Spicer Manufacturing Company manufactured universal joints and drive shafts, clutches, drop forgings, sheet metal stampings, screw products, and coil springs for the automobile industry. The plant included a machine shop, box shop, lumber shop, scrap shop, heat treating building, transformer platform, forge shop, shear shed, boiler room, acid pickle building, and die sinking shop. A chemical laboratory for the analysis of steel was added in 1917. The Spicer Manufacturing Company is Dana Corporation's predecessor (USEPA, 2001b).

After the departure of the Spicer Manufacturing Company, CDE operated at what is now the Hamilton Industrial Park from 1936 to 1962, manufacturing electronic components including capacitors. It has been reported that the company also tested transformer oils for an unknown period of time. PCBs and chlorinated organic degreasing solvents were used in the manufacturing process, and it has been alleged that during CDE's period of operation, the company disposed of PCB-contaminated materials and other hazardous substances at the facility. A former employee has claimed the rear of the property was saturated with transformer oils and capacitors were also buried behind the facility during the same time period (FWENC, 2002). Since CDE's departure from the facility in 1962, it has been operated as a rental property consisting of commercial and light industrial tenants. Since the early 1960s, numerous tenants have occupied the complex. In 2007, the USEPA began implementing the OU2 ROD with the relocation of the tenants at the industrial park and demolition of the 18 buildings. Relocation of the tenants was completed in mid-2007 and demolition of buildings was completed in May 2008.

2.2.1. Previous Investigations

Environmental conditions at the former facility were first investigated by the New Jersey Department of Environmental Protection (NJDEP) in 1986. Subsequent sampling by the NJDEP and the USEPA showed the presence of elevated concentrations of PCBs, VOCs, and inorganic chemicals in facility soils, sediments, and surface water. In 1997, the USEPA conducted a preliminary investigation of Bound Brook and also collected surface soil and interior dust samples from nearby residential and commercial properties. These investigations lead to fish consumption advisories for Bound Brook and its tributaries. As a result of these sampling activities, the Site was added to the National Priority List (NPL) in July 1998. In addition, the USEPA ordered several removal actions to be performed:

- In March 1997, the USEPA ordered the owner of the facility property to perform a removal action associated with contaminated soil and surface water runoff from the facility. The removal action included paving driveways and parking areas in the industrial park, installing a security fence, and implementing drainage controls.
- In 1998, the USEPA initiated a removal action to address PCBs in interior dust at houses to the west and southwest of the facility.
- In 1998, the USEPA ordered CDE and Dana Corporation to implement a removal action to address PCBs in soils at six residential properties located to the west and southwest of the facility. This removal action was conducted by CDE from 1998 to 1999.

- In 1999, the USEPA ordered CDE and Dana Corporation to implement a removal action to address PCBs in soils at seven residential properties located to the west and southwest of the facility. This removal action was conducted from 1999 to 2000.
- In April 2000, the USEPA entered into an Administrative Order on Consent (AOC) with D.S.C. of Newark Enterprises, Inc. (DSC) requiring the removal of PCB-contaminated soil from one additional property located on Spicer Avenue. DSC agreed to perform the work required under the AOC, but subsequently did not do so. In August 2004, the USEPA began the removal of PCB-contaminated soil from this property; the work was substantially completed in September 2004.

In 2000, an RI was conducted by Foster Wheeler, Inc. that included the collection of soil, sediment, and building surface samples, as well as the installation and sampling of 12 shallow bedrock monitoring wells (FWENC, 2001b). Shortly thereafter, the USEPA divided the Site into four OUs: OU1 addresses residential, commercial, and municipal properties in the vicinity of the former CDE facility, OU2 addresses facility soils and buildings, OU3 addresses groundwater, and OU4 addresses the Bound Brook. In 2001, the USEPA issued the RI and FS for OU1.

In June 2003, the USEPA proposed a remedy for OU1, and the ROD was issued on September 30, 2003. The selected remedy included the removal of approximately 2,100 cubic yards of contaminated soils from neighboring properties, as well as indoor dust remediation where PCB contaminated dust was identified. Additional sampling (soil and dust) was also proposed to determine if further remediation was required.

In August 2001, the RI Report for OU2 was issued. The FS for OU2 was issued in April 2004, and the ROD was issued in September 2004. The remedy specified in the ROD included:

- Excavation of an estimated 107,000 cubic yards of contaminated soil containing PCBs at concentrations greater than 500 parts per million (ppm) and contaminated soils that exceed New Jersey's Impact to Groundwater Soil Cleanup Criteria (IGWSCC) for contaminants other than PCBs;
- On-Site treatment of excavated soils amenable to treatment by Low Temperature Thermal Desorption (LTTD), followed by backfilling of excavated areas with treated soils;
- Transportation of contaminated soil and debris not suitable for LTTD treatment to an off-Site facility for disposal, with treatment as necessary;
- Excavation of an estimated 7,500 cubic yards of contaminated soil and debris from the capacitor disposal areas (CDAs) and transportation for disposal off site, with treatment as necessary;
- Installation of a multi-layer cap or hardscape;
- Installation of engineering controls;
- Property restoration; and,
- Implementation of institutional controls.

In January 2008, eight deep bedrock wells were installed by USEPA to assess the hydraulic properties of the fractured bedrock and water quality of the bedrock groundwater up- and down-gradient of the former CDE facility. The wells were completed to an average depth of 150 feet below ground surface (bgs). Following completion of the well installation, groundwater samples were collected for VOCs from multiple depths using packer sampling techniques, targeting discrete water-bearing zones within each well. Additionally, groundwater samples were collected from the 12 existing shallow bedrock monitoring wells located at the former CDE facility. Groundwater samples were analyzed for VOCs. Results of the groundwater sampling indicate the presence of chlorinated VOCs in 11 of the 12 shallow bedrock wells located at the former CDE facility. Trichloroethylene (TCE) concentrations ranged from 4 µg/L in MW-

02A to 186,000 µg/L in MW-11. Results of groundwater samples collected from the eight deep bedrock wells indicate the presence of TCE in all but one well (ERT-8). TCE concentrations ranged from 1.5 µg/L in ERT-1 to 2,250 µg/L in ERT-2.

3. INITIAL EVALUATION

3.1. REVIEW OF EXISTING DATABASE

3.1.1. Topography and Drainage

The developed portion of the former CDE facility (the northwestern portion) comprises approximately 45 percent of the total land area and contained the buildings which have been demolished. This northwestern portion is gently sloping, with pre-building demolition elevations ranging from approximately 70 to 82 feet above mean sea level (msl). The other approximately 55 percent of the property is undeveloped and is predominantly vegetated. The central part of the undeveloped portion is primarily an open field, with some wooded areas to the south and a paved area in the middle at the location of the recent remedial activities at the CDA, an area where specific capacitor-related debris had been observed. This area is relatively level, with pre-CDA remediation elevations ranging from approximately 71 to 76 feet above msl. The property drops steeply to the northeast and southeast, and the eastern portion of the property consists primarily of wetland areas bordering Bound Brook. Elevations in this area range from approximately 71 feet above msl at the top of the bank to approximately 60 feet above msl along Bound Brook (Foster Wheeler, 2001). Current surface elevations have been mapped by the building demolition contractor and will be utilized as necessary in RI reporting.

Pursuant to the September 2004 ROD for OU2, the remedial design for the soil component of the remedy includes asphalt capping for the majority of the industrial park and the construction of a stormwater detention basin as part of a new stormwater drainage system.

3.1.2. Climate

The climate for Middlesex County is classified as temperate. Polar continental air masses control the region's winter weather and tropical air masses control summer weather. In the summer these tropical air masses, largely originating over the Gulf of Mexico, travel about 1,000 miles over land before arriving in New Jersey. Although the heaviest rains are produced by coastal storms of tropical origin, a portion of the air masses originate from the Great Lakes. Prevailing winds are from the northwest from October through April, and from the southwest the remainder of the year.

In South Plainfield, the temperature ranges from an average of 29 degrees Fahrenheit in January to an average of 75 degrees Fahrenheit in July, with an average annual temperature of about 53 degrees Fahrenheit (FWENC, 2002). Summer temperatures occasionally exceed 100 degrees Fahrenheit and temperatures in the middle to upper 80's (degrees Fahrenheit) occur frequently. Winter temperatures generally are not below 20 degrees Fahrenheit for long periods of time (FWENC, 2002). The average annual precipitation is approximately 49 inches. Precipitation occurs fairly evenly throughout the year.

3.1.3. Geology

3.1.3.1. Regional Geology

The Site lies within the Piedmont Physiographic Province (Fenneman, 1938).

Surficial Geology

Quaternary and pre-Quaternary glacial and glacial-fluvial deposits overlie bedrock across much of the northern portion of New Jersey. Figure 3-1 shows the glacial and surficial geologic units near the Site, including: 1) Qal - alluvium, 2) Qwfv – Late Wisconsin glaciofluvial sand and gravel (outwash plain) deposits, 3) Qs - swamp and marsh deposits, 4) Qws - weathered shale, mudstone and sandstone, and 5) Qe - eolian deposits.

According to the data presented on this figure, the Site is located on weathered shale, mudstone, and sandstone deposits. These materials consist of reddish-brown to yellow sandy, silty clay to clayey, silty sand containing some shale, mudstone, and sandstone fragments. These unconsolidated and weathered bedrock materials can be as much as 30 feet thick but are generally less than 10 feet thick (FWENC, 2002).

Bedrock Geology

The Site is located within the Newark Basin, which is a tectonic rift basin that covers roughly 7,500 square kilometers extending from southern New York through New Jersey and into southeastern Pennsylvania (Figure 3-2). The basin is filled with Triassic-Jurassic sedimentary and igneous rocks that are tilted, faulted, and locally folded. Most of the tectonic deformation occurred during the Late Triassic to Middle Jurassic. The Newark Basin probably evolved from a series of smaller, isolated sub-basins occurring along several normal faults early in the Late Triassic. As continental extension continued the basin grew in width and length depositing sub-braided and meandering stream deposits (Stockton Formation) grading into lakebed and mudflat deposits (Lockatong and Passaic Formations). Figure 3-2 shows the stratigraphic units of the Newark Basin and Figure 3-3 shows a geologic cross-section through the region.

The Passaic Formation (historically known as the Brunswick Formation) occupies an upper unit of the Newark Supergroup rocks in the Triassic-Jurassic Newark Basin. The basin filled with thousands of feet of sediments over a period of about 45 million years (USGS, 1998). The Passaic Formation is the thickest and most aerially extensive unit in the Newark Basin. This formation consists of mostly red cyclical lacustrine clastics including mudstone, siltstone, and shale, with minor fluvial sandstone (Michalski and Britton, 1997). The reddish color originates from reworked hematite, which comprises 5 to 10 percent of the unit. The Passaic Formation generally dips at about 5 to 15 degrees to the northwest. Specifically, at an exposure in the Rahway area (northeast of the facility), the Passaic Formation unit strikes 50 degrees northeast-southwest and dips 9 to 12 degrees to the northwest. The predominant system of fractures at that location strikes about 45 degrees northeast-southwest and are mostly vertical. A second, less prominent system strikes 75 degrees northwest-southeast and is also nearly vertical (FWENC, 2002).

Three basaltic intrusions occurred during the Lower Jurassic: Orange Mt. Basalt (also known as the First Watchung), the Preakness Basalt (also known as the Second Watchung), and the Hook Mt. Basalt (also known as the Third Watchung). These basaltic intrusions are shown on Figure 3-2 (Herman, 2001).

The Site is located immediately south of the contact between the Passaic Formation mudflat deposits, which are a thickly bedded mudstone, and the Passaic Formation, which is often thinly bedded sandstone and siltstone (Figure 3-4).

3.1.3.2. Site-Specific Geology

The geologic interpretations presented below are based on boring logs provided in the Final Remedial Investigation Report for OU2 Facility Soils and Buildings (FWENC, 2002). Unconsolidated soils range in thickness from 0.5 to 15 feet and generally thicken towards Bound Brook. The unconsolidated material is composed of layers of fill material, red-brown silty sand, and red-brown silt. The fill material can be a mixture of various amounts of ash, cinders, brick, glass, metal, slag, or wood. The red-brown silty sand can be characterized as red-brown silt and fine sand with little sub-angular to angular siltstone gravel and a trace of silty clay.

A layer of weathered bedrock overlies competent bedrock. The top of consolidated bedrock underlying the facility ranges from 4 to 15 feet bgs, except in the far northwestern corner of the property where bedrock was encountered immediately underlying the building slabs. The bedrock surface slopes to the south-southeast and consists of red-brown to purplish-red mudstone and siltstone with localized beds of fine-grained sandstone. Each of these units contained heavily fractured zones that occurred along the bedding planes.

Weathered fracture zones within the bedrock ranged from near vertical to horizontal. However, the majority of these features were low angle (20 to 30 degrees from horizontal), and the average spacing between fractures ranged from less than one to six inches (FWENC, 2002).

3.1.4. Hydrogeology

3.1.4.1. Regional Hydrogeology

The Passaic Formation contains an aquifer that is used as a source of potable water for some of the communities surrounding the former CDE facility. Numerous private, industrial, and municipal wells tap the formation with pumping rates that range from a few to several hundred gallons per minute. The Passaic Formation generally forms tabular aquifers and confining units that are several tens of feet thick. Groundwater flow is primarily through bedding planes and interconnected fractures and dissolution channels (secondary permeability). A very limited amount of groundwater flows through the interstitial pore spaces between silt or sand particles because of compaction and cementation of the formation (primary permeability). Differences in permeability between layers resulting from variations in fracturing and weathering may account for many water bearing units.

According to Michalski and others, these water bearing units are generally restricted to bedding planes, intensively fractured seams, and near vertical fracture and joints that are sub-parallel to the strike of the formation in this leaky multi-layered aquifer system (Michalski, 1990, Michalski and Klepp, 1990, Michalski and Britton, 1997). Michalski and Britton (1997) contend that this is typically true because potential groundwater flow in the downdip direction is either impeded by a reduction in bedding plane apertures at greater depths or groundwater flow along the strike is favored over a longer downdip flow path and subsequent updip flow near a recharge zone. However, groundwater could flow downdip through a fracture network and/or along bedding planes if groundwater flow is affected by pumping wells in the area.

Groundwater in the Passaic Formation is often unconfined in the shallower, more weathered part of the aquifer and confined or semi-confined in the deeper part of the aquifer. Silt and clay derived from the weathering process typically fill fractures, thereby reducing permeability. This relatively low permeability surface zone reportedly extends 50 to 60 feet bgs (Michalski, 1990). Groundwater in the lower portion of the Passaic Formation is generally semi-confined. Recharge is by leakage through fractures in the confining units.

The Transmissivity of mudstone and siltstone units can range from 400 to 14,500 gallons per day per foot (gpd/ft) (Herman, 2001).

3.1.4.2. Site-Specific Hydrogeology

Perched water was encountered during the completion of test pits and the drilling of monitoring well borings on the former CDE facility. The shallow unconsolidated materials, overlying the bedrock, exhibited discontinuous zones of perched water, which occurred frequently where unconsolidated natural and fill materials were variable in composition. The depths of the perched water zones were variable across the facility, although they typically occurred in the range of four to eight feet bgs. The layers of silt, clay, and weathered siltstone and fill materials provide the relative resistance to vertical flow that allows these perched zones to occur during sufficiently wet periods. The perched water in the overburden beneath the facility is not considered a water-bearing zone (FWENC, 2001a).

Little information has been collected to date to characterize the bedrock hydrogeology at the Site. During the 2000 RI, 12 monitoring wells were installed at the former CDE facility in the first water-bearing zone of the shallow bedrock. Competent bedrock was encountered between 4 and 15 feet bgs during drilling. Hydraulic head measurements were collected and the groundwater table was encountered in bedrock from 25 to 40 feet above msl (35 to 50 feet bgs). The potentiometric surface of the water table was mapped in October 2000 as shown on Figure 3-5. The potentiometric head measurements show that the hydraulic gradient was 0.0015 feet/feet and sloped to the northwest.

Based on this information, and in conjunction with a preliminary review of the early 2008 U.S. Geological Survey (USGS) borehole geophysics, FLUTe™ drop liner test data, and the non-validated packer groundwater sampling data, it appears that groundwater from the facility is flowing to the north-northwest in the downdip direction of the bedding planes. This is evidenced by the high concentrations (>500 µg/L) of TCE detected in groundwater samples collected from monitoring wells ERT-3 and ERT-4 in the downdip direction of bedrock and the low concentrations (<50 µg/L) of TCE in groundwater samples collected from monitoring wells ERT-6 and ERT-7 that are located along the line of bedrock strike. Figure 3-6 shows the distribution of TCE in groundwater samples in January 2008. This data is inconsistent with descriptions in the published literature on the Passaic Formation that groundwater flow is generally along the strike of the bedrock formation (southwest). The apparent groundwater flow direction may be attributed to the operation of nearby water supply wells and/or a well established shallow fracture network to the northwest. It should be noted that even though groundwater appears to flow in the downdip direction of the bedding plane, groundwater flow is likely influenced by a shallow fracture pattern in the bedrock. This is evidenced by the fact that TCE was detected at relatively shallow depths (<140 feet bgs) at monitoring wells ERT-3 ad ERT-4 while a bedding plane that may originate at the former CDE facility would have been much deeper at ERT-3 and ERT-4 (roughly 280 feet based on an eight degree dip).

Some TCE was detected to the southwest along the strike of the bedrock. This TCE could have originated from the former CDE facility, possibly caused by transient pumping of nearby wells or anisotropic groundwater flow directions, or could be from another source of contamination.

3.1.5. Population and Environmental Resources

Population, Land Use, Zoning - The former CDE facility is located in the central portion of New Jersey in what can be characterized as an urban area. The land use surrounding the former CDE facility is primarily commercial/light industrial to the northeast and east, residential to the south and north, and mixed residential/commercial to the west. The former CDE facility is currently zoned as commercial/industrial.

South Plainfield is located at 40°34′51″N, 74°24′50″W and is bordered by Piscataway on the south and west, Edison on the east, and Plainfield on the north. According to the 2006 Census estimate, South Plainfield has a population of approximately 22,795 people with a total land area of approximate 8.4 square miles (city-data.com), of which, 8.36 square miles (99.52%) is land and 0.04 square miles (0.48%) is water. South Plainfield's population includes Caucasian (78%), African American (9%), Asian (8%), and Hispanic and other racial and ethnic groups (5%).

The area within 1.5 miles of the former CDE facility contains eight schools and five parks. Two elementary schools are located approximately 2,000 feet from the former facility (one to the north and one to the south).

Environmental Resources – Bound Brook is directly adjacent to the former facility and forms the northeast border of the property. Bound Brook Corridor, the portion of Bound Brook adjacent to and downstream of the former CDE facility, extends from east to west through Edison, South Plainfield, New Market, Dunellen, and Middlesex. The low topography of Bound Brook Corridor has created the watershed features, hydrology, and drainage characteristics found in the region.

The developed portion of the former CDE facility contains a network of catch basins to channel storm water runoff. Based on dye testing from the 2000 RI, it is believed that at least a portion of the catch basins drain into two outfalls along Bound Brook (FWENC, 2002).

Based on a review of National Wetlands Inventory (NWI) mapping, there are three wetland systems on the property associated with Bound Brook and its floodplain. The wetlands are classified as Palustrine Forested Broad-Leaved Deciduous Temporary (PFO1A), Palustrine Emergent Persistent Seasonal (PEM1C), and Palustrine Scrub/Shrub Broad-Leaved Deciduous Temporary (PSS1A). Wetland acreage ranges from 0.06 acres to 2.08 acres. Malcolm Pirnie completed a wetland delineation in May 2007 to demarcate wetland/non-wetland boundaries as part of the remedial design for OU2. More information can be found in the Revised Final Habitat Assessment Report for Operable Unit 2 Soils (Malcolm Pirnie, 2008).

3.1.6. Characteristics of Chemical Contamination

Chemical contamination at the former facility has been attributed to historic manufacturing activities. Previous investigations indicated elevated concentrations of VOCs, semi-volatile organic compounds (SVOCs), pesticides, PCBs, metals, and cyanide in the soils. Groundwater analytical results indicate the presence of VOCs, SVOCs, pesticides, PCBs and metals in bedrock groundwater beneath the Site.

3.1.7. Sources and Distribution of Contamination

As stated previously, CDE used PCBs and chlorinated organic solvents in their manufacturing process. The company evidently disposed of PCB-contaminated materials and other hazardous materials directly on the facility soils. These activities apparently led to widespread chemical contamination at the facility, as well as the migration of chemicals to areas throughout the Site, including adjacent residential, commercial, and municipal properties, and in the surface water and sediments of Bound Brook. Malcolm Pirnie's August 2007 Pre-Design Investigation (PDI) Report, developed in support of the soils remedial design, outlines the chemical contaminants identified in soils at the former CDE facility.

Soils containing elevated levels of VOCs, SVOCs, pesticides, PCBs, and metals were identified at the facility and may represent a source to groundwater. Groundwater samples collected during the 2000 RI from 12 shallow monitoring wells contained elevated levels of VOCs, pesticides, PCBs, metals, and dioxins. As shown in Table 3-1, TCE and its degradation product cis-1,2-dichloroethylene (cis-1,2-DCE) were detected most frequently and at the highest concentrations.

Previous hydrogeologic investigations indicate that Bound Brook is recharging the bedrock aquifer (Foster Wheeler, 2002) and therefore does not represent a discharge point. However, additional data will be collected during the RI to evaluate the hydraulic connection of the bedrock aquifer to Bound Brook. Surface water runoff and discharge from the former facility's interconnected floor drains and stormwater catch basins that may have discharged to two locations along Bound Brook may have contributed to chemical contamination in the sediments of Bound Brook. PCBs, VOCs, SVOCs, pesticides, and metals were detected in sediment and standing water samples collected from the catch basins. Previous stabilization measures (*i.e.*, paving and silt fencing) that were implemented by the property owner in 1997 addressed the potential for chemicals to reach Bound Brook via overland runoff and through the facility drainage system discharges (HydroQual, 2005).

<u>Other Potential Sources</u> – The NJDEP conducted investigations at the Pitt Street Private Well Study Area, comprised of residential wells located to the south, southwest, and west of the former CDE facility, from January 1987 through October 1990. These investigations identified the presence of chlorinated solvents, most notably TCE and tetrachloroethylene (PCE), in these wells. Other detected VOCs included: 1,2-DCE, 1,1-dichloroethylene (1,1-DCE), vinyl chloride, 1,1,1-trichloroethane (TCA), carbon tetrachloride, methyl-tert-butyl ether (MTBE), chloroform, and xylenes (HydroQual, 2005). NJDEP designated much of the area to the southwest of the facility as an area of Currently Known Extent (CKE) of groundwater pollution. CKE areas are geographically defined areas within which the local groundwater resources are known to be

compromised because the water quality exceeds drinking water and groundwater quality standards for specific contaminants.

The sources of these VOCs have not been identified. However, searches of the NJDEP Comprehensive Site List (CSL) and Environmental Data Resources Inc. (EDR) databases yielded over one hundred sites within approximately one mile of the Pitt Street Private Well Study Area that may be considered as potential sources of VOCs in groundwater. A limited file review of contaminated sites within one-quarter mile of the former CDE facility was conducted by others focusing on contributing sources to Bound Brook. A summary of results was provided in Tetra Tech May 2006. This information will be supplemented with a more comprehensive file review of known contaminated sites within one mile of the former CDE facility. A summary of findings will be included in the RI Report.

3.1.7.1. Chemical Characteristics of Soil

During previous soil investigations, shallow (0-2' bgs) and subsurface (2-14' bgs) soils were sampled and analyzed for VOCs, SVOCs, PCBs, dioxins/furans, pesticides, and inorganics/cyanide. A brief summary of the results of these investigations was given in Malcolm Pirnie's 2007 Soils PDI Report (Malcolm Pirnie, 2007). That summary is also presented below.

<u>PCBs and Dioxins/Furans</u> - PCBs were ubiquitous in shallow soils at the former facility. PCB congeners were analyzed in a small portion of the shallow soil samples collected. Of the 94 congeners analyzed, 61 were present in the shallow soils. Total PCB congener concentrations ranged from 460 micrograms per kilograms (µg/kg) to 53,000 µg/kg. Soil samples were analyzed for dioxins and furans and contained detectable concentrations of these chemicals. Concentrations of individual dioxin/furan chemicals ranged from 173 to 13,510 picrograms per gram (pg/g).

PCBs were ubiquitous in subsurface soils and their concentrations appeared to be principally dependent upon the specific sample location. The most prevalent Aroclor that exceeded the ROD soil cleanup criteria of 500 ppm was Aroclor 1254. Three subsurface samples were analyzed for PCB congeners, and of the 94 congeners analyzed, 65 were present in one of the samples and 72 were present in the other two samples. Total PCB congener concentrations ranged from 770 µg/kg (4-6’ bgs) to 39,000,000 µg/kg (4-6’ bgs).

<u>VOCs and SVOCs</u> – Thirty individual VOCs were detected in shallow soils with TCE, and its degradation products, cis-1,2-DCE and vinyl chloride, being the most prevalent. Thirty-two SVOCs were detected in shallow soils, with two general chemical classes – phthalates and polycyclic aromatic hydrocarbons (PAHs) – constituting the majority of the detections in shallow soils.

Subsurface soils also contained VOCs and SVOCs at elevated levels. The most prevalent VOCs in subsurface soils were TCA, cis-1,2-DCE, acetone, toluene, PCE, TCE, and vinyl chloride. Twenty-nine individual SVOCs were detected in subsurface soils.

<u>Pesticides</u> - Nineteen pesticides were detected in shallow soils with the highest frequency of detections from samples collected in the northern and southern developed portions of the property. Concentrations of aldrin, dieldrin, and 4,4’-DDE were above New Jersey’s IGWSCC.

Eighteen pesticides were detected in subsurface soils. Concentrations exceeding New Jersey’s IGWSCC in subsurface soils were typically found in the same areas of the property as they were in the shallow soils. Concentrations exceeding the IGWSCC were noted for aldrin, dieldrin, endrin aldehyde, and 4,4’-DDT in the 2-6 foot depth interval. Only one pesticide, 4,4’-DDE, was detected above the IGWSCC in the 6-14 foot depth interval.

<u>Metals and Cyanide</u> – Metals and cyanide were detected in the shallow soils throughout many different areas and the maximum concentrations were present in the northern and southern developed portions of the property.

Subsurface soils contained detections of all 23 metals analyzed and cyanide. Maximum concentrations of over half of these chemicals were present in the central, undeveloped portions of the property, which is in contrast to the trend of maximum concentrations in the shallow soils. The extent of metals contamination was not reviewed as part of the PDI, as the September 2004 ROD for OU2 did not provide Site-specific cleanup criteria and New Jersey's IGWSCC defers to site-specific cleanup levels. The overall trend of distribution and magnitude of concentrations for metals and cyanide appeared to correlate with Total PCBs in subsurface soils. Metals contamination was evaluated for the sole purpose of waste characterization for evaluating soil disposal options.

3.1.7.2. Chemical Characteristics of Groundwater

2000 Investigation - Groundwater samples were collected from perched water encountered during test pit excavations, 12 shallow bedrock monitoring wells, and one production well in 2000. Results of these investigations indicate elevated concentrations of VOCs, PCBs, dioxin/furans, PAHs, and pesticides in the perched groundwater zones and shallow bedrock monitoring wells. Specific findings include:

- The perched water samples collected from the test pits contained 26 identifiable SVOCs, including phenols, PAHs, and phthalate esters. Ten pesticides were detected in the test pit perched water samples.
- Elevated PCB concentrations (*i.e.*, individual Aroclors up to 5,100 µg/L and Total PCBs up to 7,400 µg/L) were present in the perched water samples predominantly in the central portion of the facility.
- Nineteen VOCs were detected in the perched water samples; detected concentrations ranged from 0.4 µg/L (1,1,2,2-trichloroethane, benzene) to 15,000 µg/L (TCE).
- Groundwater samples from MW-11 and MW-12 contained the highest number of chemicals (*i.e.*, both samples contained 17 VOCs) and the most elevated concentrations (*i.e.*, the samples contained maximum concentrations for 53% of the detected VOCs, at levels up to 15,000 µg/L).

- Elevated dioxin/furan concentrations were identified in monitoring well MW-11 and total concentrations ranged from 11.3 picograms per liter (pg/L) to 144 pg/L.

<u>2008 Investigation</u> - During January 2008, eight deep bedrock wells were installed by USEPA to assess the hydraulic properties of the fractured bedrock and water quality of the bedrock groundwater up- and down-gradient of the former CDE facility. The wells were completed to an average depth of 150 feet bgs. Following completion of the well installation, groundwater samples were collected from multiple depths using packer sampling techniques, targeting discrete water-bearing zones within each well. Additionally, groundwater samples were collected from the 12 existing shallow bedrock monitoring wells located at the former CDE facility. Groundwater samples were analyzed for VOCs only. Results of the groundwater sampling indicate the presence of chlorinated VOCs in 11 of the 12 shallow bedrock wells located at the former CDE facility. Trichloroethylene (TCE) concentrations ranged from 4 μg/L in MW-02A to 186,000 μg/L in MW-11. Results of groundwater samples collected from the eight deep bedrock wells indicate the presence of TCE in all but one well (ERT-8). TCE concentrations ranged from 1.5 μg/L in ERT-1 to 2,250 μg/L in ERT-2. Figure 3-6 shows the results of TCE in groundwater samples collected in January 2008.

The results of the previous investigations indicate that contaminated soils at the former CDE facility may be contributing VOCs, pesticides, PCBs, dioxins/furans, and metals to the groundwater beneath the property. Furthermore, the detection of VOCs in seven deep bedrock wells installed in 2008 indicates that contaminated groundwater may be migrating down-gradient and outside the limits of the former facility.

By contrast, perched water encountered during the completion of test pits and the drilling of monitoring well borings on the former CDE facility does not appear to be contributing contamination to the bedrock groundwater. The perched water samples collected from the test pits contained 26 identifiable SVOCs, including phenols, PAHs, and phthalate esters. With the exception of bis-2-ethylhexyl phthalate, SVOCs were not detected in the shallow bedrock groundwater samples. As stated in Section 3.1.4.2 above, the perched water zones were discontinuous and occurred at varying depths across the facility. The perched water in the overburden beneath the facility is not considered a water-bearing zone (FWENC, 2001a).

3.1.7.3. Chemical Characteristics of Soil Gas

Soil gas samples were collected by the USEPA in 2007 from 24 residential properties in the vicinity of the former CDE facility to evaluate the potential for subsurface vapor release to indoor air via vapor intrusion.

TCE was detected in 13 of the 27 sub-slab samples at concentrations ranging from 0.17 to 3.9 micrograms per cubic meter (μg/m^3). The residential soil gas screening level for TCE from the NJDEP Vapor Intrusion Guidance Document is 27 μg/m^3. PCE was detected in all 27 sub-slab samples at concentrations ranging from 0.74 to 200 μg/m^3. The residential soil gas screening level for PCE from the NJDEP Vapor Intrusion Guidance Document is 34 μg/m^3. In addition to TCE and PCE, 1,1-DCE (3 samples) and cis-1,2-DCE (1 sample) were detected in sub-slab soil vapor at concentrations less than the NJDEP Residential Soil Gas screening values for these chemicals.

3.2. PRELIMINARY IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Section 121(d)(2)(A) of CERCLA incorporates into law the CERCLA Compliance Policy, which specifies that Superfund remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). State ARARs must be met if they are more stringent than federal requirements.

Furthermore, Section 121 requires the selection of a remedial action that is protective of human health and the environment. Determining protectiveness involves a risk assessment in accordance with CERCLA guidance.

To Be Considered Criteria (TBCs) are non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs. As described below, TBCs will be considered along with potential ARARs as part of the risk assessment for OU3 groundwater and may be used in determining the necessary level of cleanup for protection of human health and the environment.

The USEPA requires that the implementation of remedial actions should also comply with ARARs (and TBCs as appropriate) to protect public health and the environment. ARARs (and TBCs necessary for protection), pertaining both to chemical levels and to performance or design standards, should generally be attained at all points of exposure, or at the point specified by the ARAR itself. ARARs (and TBCs necessary for protection) must be attained for hazardous substances, pollutants, or chemicals remaining at the completion of the remedial action, unless waiver of an ARAR is justified.

This section of the Work Plan provides a preliminary determination of the federal and state environmental and public health requirements that are potential ARARs and TBCs for OU3 groundwater. The information in this section is based upon *CERCLA Compliance with Other Laws Manual: Interim Final* (USEPA, 1988a) and *CERCLA Compliance with Other Laws Manual: Part II, Clean Air Act and Other Environmental Statutes and State Requirements* (USEPA, 1989c).

3.2.1. Definition of ARARs

A requirement under other environmental laws may be either "applicable" or "relevant and appropriate" but not both. Identification of ARARs must be done on a site-specific basis and involves a two-part analysis: 1) a determination whether a given requirement is applicable; 2) if it is not applicable, a determination whether it is nevertheless both relevant and appropriate.

Applicable Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, chemical, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal law or state law, while not "applicable" to a hazardous substance, pollutant, chemical, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Three classifications of ARARs have been established and include:

- Chemical-Specific – usually health or risk-based numerical values or methodologies, which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.
- Location-Specific – restriction placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations.
- Action-Specific – usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

3.2.2. Preliminary Identification of Potential ARARs and TBCs

Several federal and state requirements, treatment standards, goals, and guidance values are established for the chemicals that have been preliminarily identified in the groundwater at the Site. These criteria have been derived from drinking water and aquifer protection programs, corrective action programs, and health/risk-based determinations.

The New Jersey State Water Quality Standards – Groundwater Classifications and Standards for aquifer classification IIA, (NJAC 7:9-6), are used to protect human health and the environment. These standards, determined to be appropriate requirements for the Site, identify Class IIA groundwater as fresh groundwater within the unconsolidated zone or consolidated rock or bedrock that is suitable as a potable water supply source. New Jersey State Ground Water Quality Criteria (GWQC) establishes groundwater quality standards (*i.e.*, organics, PCBs, pesticides, inorganics, etc.) for various classes of groundwater.

The New Jersey State Safe Drinking Water Act (NJAC 7:10 1.1-7.3) provides standards for the treatment of New Jersey groundwater and surface water for all "public potable water systems". The state has established Maximum Chemical Levels (MCLs) for public potable water supplies. These state MCLs are required under the groundwater standards described above. Most of the MCLs are chemical-specific ARARs for each of the chemicals of potential concern identified in this Work Plan.

The Federal Safe Drinking Water Act MCLs provide standards for the treatment of groundwater and surface water for public potable water supplies. These standards are applicable requirements for the Site.

The following is a comprehensive list of all possible sources of potential ARARs and TBCs for groundwater at the Site.

3.2.2.1. Potential ARARs

Chemical-Specific Federal ARARs

- Safe Drinking Water Act, Maximum Chemical Levels (MCLs) (40 CFR [Code of Federal Regulation] Parts 141.11-.16).
- Resource and Conservation and Recovery Act (RCRA) Groundwater Protection Standards and Maximum Concentration Limits (40 CFR Part 264, Subpart F).

- Resource and Conservation and Recovery Act (RCRA) Toxicity Characteristic Leachate Procedure (TCLP) requirements for waste disposal.
- Clean Water Act, Ambient Water Quality Criteria (AWQC) (section 304) and Effluent Discharge Limitations.
- National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50).
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61).
- New Source Performance Standards (NSPS) (40 CFR Part 60).

Chemical-Specific State ARARs

- New Jersey State Safe Drinking Water Act Maximum Chemical Levels (MCLs, NJAC 7:10 1.1-7.3).
- New Jersey State Ground Water Quality Criteria (GWQC, NJAC 7:9-6).
- New Jersey Clean Water Act, Surface Water Quality Standards (NJAC 7:9-4).
- New Jersey Soil Cleanup Standards for Contaminated Sites (NJAC 7:26D).
- New Jersey State Toxic Effluent Limitations (NJAC 7:14A-1 et seq.).
- New Jersey Clean Air Act (NJAC 7:27-13 and NJAC 7:27-17).

Location-Specific Federal ARARs

- Protection of Wetlands (Executive Order 11990).
- Wetlands Construction and Management Procedures (40 CFR 6, Appendix A).
- Clean Water Act, Section 404 (40 CFR 230, 33 CFR 320-330).
- Protection of Floodplains (Executive Order 11988).
- Flood Disaster Protection Act of 1973.

- USEPA's 1985 Statement on Floodplains and Wetlands Assessment for CERCLA actions.
- National Historic Preservation Act (16 CFR Part 470) Section 106 et seq.
- RCRA Location Requirements for 100-year Floodplains (40 CFR Part 264.18(b)).
- Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).
- Safe Drinking Water Act (40 CFR 141, 142, 143), National Primary and Secondary Drinking Water Regulations.

Location-Specific State ARARs

- New Jersey State Freshwater Wetlands Protection Act (NJSA 13:9B).
- New Jersey State Freshwater Wetlands Regulations (NJAC 7:7).
- New Jersey State Flood Hazard Area control Act (NJSA 58:16A-50).
- New Jersey Conservation Restriction and Historic Preservation Restriction Act (NJSA 13:8 B-1).

Action-Specific Federal ARARs

- National Contingency Plan (40 CFR 300, CERCLA Title I Section 101,111).
- Superfund Amendments and Reauthorization Act (SARA; 42 U.S.C. 9601).
- Hazardous and Solid Waste Amendments of 1984 (HSWA).
- RCRA (40 CFR 264) Subpart F, Groundwater Protection.
- RCRA (40 CFR 262), Generator Requirements for Manifesting Waste for Off-Site Disposal.
- RCRA (40 CFR 263), Transporter Requirements for Off-Site Disposal.
- RCRA (40 CFR 268), Land Disposal Restrictions.
- Safe Drinking Water Act (40 CFR 141, 142, 143), National Primary and Secondary Drinking Water Regulations.

- Safe Drinking Water Act (40 CFR 144 and 146), Underground Injection Control Requirements.
- Clean Water Act (40 CFR 122-125), National Pollutant Discharge Elimination System (NPDES) Permit Requirements.
- Clean Air Act (40 CFR 50), National Pollutant Discharge Elimination System (NPDES) Permit Requirements.
- Clean Air Act (40 CFR 50), National Ambient Air Quality Standards (NAAQS) – Particulates.
- Clean Air Act (40 CFR 50), New Source Performance Standards (NSPS).
- Clean Air Act (40 CFR 61) National Emissions Standards for Hazardous Air Pollutants (NESHAPS).
- Hazardous Materials Transportation Act, (49 CFR 107,171), Rules for Transportation of Hazardous Materials.
- Occupational Safety and Health Act (29 CFR 1904), Recordkeeping, Reporting, and Related Regulations.
- Occupational Safety and Health Act (29 CFR 1910), General Industry Standards.
- Occupational Safety and Health Act (29 CFR 1926), Safety and Health Standards.

<u>Action-Specific State ARARs</u>

- New Jersey Technical Requirements for Site Remediation (NJAC 7:26E)
- New Jersey Hazardous Waste Regulations (NJAC 7:26), Permitting, Contingency Plans, Specifications for Treatment/Disposal Units.
- New Jersey Pollutant Discharge Elimination System (NJAC 7:14A-1.1 et seq.), Permit/Discharge Requirements.
- New Jersey Surface Water Regulations (NJAC 7:9-5.1), Effluent Standards/Treatment Requirements.

- New Jersey Air Pollution Control Regulations (NJAC 7:27-16), Permits and Emissions Limitations for VOCs.
- New Jersey Air Pollution Control Regulations (NJAC 7:27-17), Toxic Substance Emissions.
- New Jersey Air Pollution Control Regulations (NJAC 7:27-12), Emergency Situations.
- New Jersey Water Supply Management Act (NJAC 7:19), General Water Supply Management Regulations.
- New Jersey Safe Drinking Water Act (NJAC 7:10), Monitoring Standards for Public Water Supply Systems.

3.2.2.2. Potential TBCs

Federal TBCs

- Safe Drinking Water Act National Primary Drinking Water Regulations, Maximum Chemical Level Goals (MCLGs), 40 CFR Part 141.
- Proposed Federal Air Emission Standards for Volatile Organic Control Equipment (52 Federal Register 3748) (air stripper controls).
- Proposed Requirements for Hybrid Closures (combined waste-in-place and clean closures) (52 Federal Register 8711).
- Proposed RCRA Corrective Action Criteria (40 CFR Parts 265, 270, and 271), July 1990.
- Regional Screening Levels for Chemical Contaminants at Superfund Sites.
- USEPA Integrated Risk Information System (IRIS).
- USEPA Drinking Water Health Advisories.
- USEPA Health Effects Assessment Summary Tables.
- USEPA Superfund Technical Support Center's National Center for Environmental Assessment (NCEA).

- Toxicological Profiles, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.
- Policy for Development of Water Quality-Based Permit Limitations for Toxic Pollutants (49 Federal Register 9016).
- Cancer Assessment Group (national Academy of Science) Guidance.
- Groundwater Classification Guidelines.
- Groundwater Protection Strategy.
- Fish and Wildlife Coordination Act Advisories.

State TBCs

- New Jersey Water Supply Management Regulations (NJAC 7:19).
- New Jersey Air Pollution Control Regulations (NJAC 7:2-17).

3.3. PRELIMINARY HUMAN HEALTH RISK ASSESSMENT

The purpose of this qualitative preliminary human health risk assessment is to formulate a conceptual site exposure model (CSEM) for OU3 groundwater and to identify preliminary chemicals of potential concern (COPCs) using existing data. The assessment is based upon the current understanding of the Site, including, the Site history, the extent and magnitude of chemical contamination, current and potential future land use, demography, hydrogeology, and other data presented in this Work Plan. The RI sampling data, once analyzed and validated, will be used to quantitatively evaluate baseline human health risks associated with exposure to chemicals in groundwater at the Site.

This assessment follows guidance in the USEPA's *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)* (USEPA, 1989b). This is a companion document to the USEPA's RI/FS guidance document, *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA* (USEPA, 1988b).

3.3.1. Chemicals of Potential Concern

The preliminary COPCs were selected by comparing existing groundwater data for the Site to the 2008 Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, for tap water, developed by Oak Ridge National Laboratory, and the most stringent of the federal MCLs, state MCLs, and the NJ Groundwater Quality Standards. The chemicals in groundwater that pose a potential risk to human health are listed in Table 3-1 and are preliminarily identified as COPCs in groundwater. Identification as a preliminary COPC is based on the availability of toxicity values to derive the screening levels and comparison of the maximum detected concentration to the risk-based screening levels and the potential groundwater ARARs (i.e., the most stringent of the federal and state MCLs and NJ Groundwater Quality Standards). Chemicals whose maximum detected concentration exceeded either screening levels and detected chemicals without screening levels are identified as preliminary COPCs. Consideration was not given to the frequency of detection.

3.3.2. Potential Source Areas and Release Mechanisms

As described previously, CDE apparently disposed of PCB-contaminated materials and other hazardous substances directly on the facility soils. These activities apparently led to widespread chemical contamination at the facility, as well as the migration of chemicals to areas throughout the Site, including adjacent residential, commercial, and municipal properties, and in the surface water and sediments of Bound Brook. In addition, chlorinated solvents, most notably TCE and PCE, have been detected in a number of residential wells located to south, southwest, and west of the former CDE facility (Pitt Street Private Well Study Area). The sources of these VOCs have not been identified. However, searches of the NJDEP CSL and EDR databases yielded over one hundred sites within approximately 1 mile of the Pitt Street Private Well Study Area that may be considered as potential sources of VOCs in groundwater.

Secondary release mechanisms include infiltration and percolation through soils to groundwater. In addition, discharge from interconnected floor drains (from the recently demolished buildings) and storm water catch basins used at the former CDE facility that are believed to discharge to two locations along Bound Brook may also act as release mechanisms. In the event of subterranean activities, particulate and vapor emissions are also possible secondary release mechanisms.

3.3.3. Potential Exposure Pathways and Receptors

Exposure pathways related to OU3 are addressed in this Work Plan. Possible routes of human exposure that will be evaluated include ingestion of and dermal contact with chemicals in groundwater and inhalation of chemicals in indoor air from household use of groundwater or intrusion of subsurface vapors. Exposure pathways related to surface water and sediment will be addressed in the future as part of OU4 to be performed under separate contract.

Analysis of the groundwater pathway considers the following:

- The potential for contact with dissolved chemicals during either potable or non-potable use of the groundwater in or on residential, commercial/industrial, and other properties throughout the vicinity of the Site.
- Vapor emissions to outdoor air.

Generally, the exposure concern with potable use of groundwater is the potential for ingestion of chemicals detected in the groundwater and inhalation of and dermal contact with chemicals in the groundwater during routine household uses (*e.g.*, bathing, cleaning). Non-potable use of the groundwater may be for sanitary, process, irrigation, or other purposes. The exposure concern with non-potable use of the groundwater is the potential for dermal contact with, inhalation of, and incidental ingestion of chemicals in the groundwater.

Potentially exposed receptors include: residents (adults and children), workers (adults), and construction/utility workers (adults).

3.3.4. Conceptual Site Exposure Model

The CSEM for exposure to chemicals in groundwater is presented in Table 3-2. As previously discussed, the primary source of contamination is the facility soils. As contaminated soils are being addressed separately in OU2, this assessment will focus on groundwater (OU3) as a secondary source of contamination. Secondary release mechanisms that can facilitate the migration of chemicals include: infiltration/percolation, vapor emissions (to indoor and outdoor air), and groundwater migration/discharge.

3.4. SUMMARY OF ADDITIONAL DATA NEEDS

Additional data are needed to further characterize the nature and extent of groundwater contamination, to evaluate the mass of VOCs and PCBs in the groundwater and bedrock matrix, and to assess the physical and hydraulic properties of the bedrock aquifer. Previous studies of groundwater contamination in fractured porous sedimentary bedrock have shown that although VOCs are transported through a network of interconnected fractures, most VOC mass is eventually transferred to the rock matrix through diffusion-driven chemical mass transfer interactions. These processes can have a strong influence on the fate and transport of VOC mass. Therefore, characterizing the chemical quality of the groundwater in fractures in conjunction with characterizing the mass in the rock matrix is important to predicting the fate and transport of VOC mass and for evaluating remedial alternatives. This is called the Discrete-Fracture Network (DFN) (Parker, 2007) approach to sedimentary bedrock characterization and is used to guide the identification of potential data gaps and determine the scope of work necessary to fill the data gaps.

Based on an evaluation of the existing groundwater data, the following actions are proposed to fill these data gaps:

Nature and Extent of Groundwater Contamination at the former CDE facility

- To define the lateral and vertical distribution and the amount of chemical mass in the rock matrix beneath the former facility, two of the three monitoring well borings will be cored and rock samples will be collected for VOC and PCB analyses.
- To define the vertical extent of groundwater contamination beneath the former facility, three multi-port bedrock wells will be installed to the maximum depth of VOCs detected in the rock samples collected from the two cored monitoring well borings. Note: For planning purposes, it was assumed that these monitoring wells would be completed to a total depth of 250 feet bgs and would contain 10 sampling ports.
- To evaluate whether Non-Aqueous Phase Liquid (NAPL) is present in the bedrock aquifer, a temporary NAPL absorbent liner (NAPL FLUTe™ System) will be installed in all three deep bedrock wells.

Nature and Extent of Groundwater Contamination in the Vicinity of the Former CDE Facility

- To define the lateral and vertical distribution and amount of chemical mass in the rock matrix, one of the monitoring well borings will be cored and rock samples will be collected for VOC analyses. This 'matrix diffusion' boring will be located near Spring Lake, the presumed down-gradient boundary of groundwater contamination. Note: An additional monitoring well boring to be located next to existing well ERT-3 was selected as a contingent matrix diffusion boring in the event no VOCs are detected in rock samples collected from the furthest down-gradient matrix diffusion boring.
- To define the horizontal and vertical extent of groundwater contamination beneath the area surrounding the former CDE facility, six multi-port wells will be installed to the maximum depth of detectable concentrations of

VOCs in the rock matrix diffusion borings. Note: For planning purposes, it was assumed that these monitoring wells would be completed to a total depth of 250 feet bgs and would contain 10 sampling ports.

- To evaluate whether NAPL is present in the bedrock aquifer immediately down-gradient of the former facility, a temporary NAPL absorbent liner (NAPL FLUTe™ System) will be installed in the well proposed to be installed adjacent to ERT-2.

<u>Physical and Hydraulic Properties of the Aquifer</u>

- To evaluate the potential hydraulic connection between the water table aquifer and Bound Brook, three staff gauges will be installed in Bound Brook and the hydraulic heads from the Bound Brook staff gauges will be compared to the hydraulic heads in the Passaic Formation water bearing units.
- To define the water bearing zones of the Passaic Formation, hydraulic profiling of fractures will be performed during installation of temporary FLUTe™ Liners to identify water bearing zones and zones that could be identified as confining units.
- To define the Hydraulic Conductivity (K) of the Passaic water bearing zones, the FLUTe™ liner hydraulic profiling data will be used to estimate the hydraulic conductivity of each zone.
- To evaluate aquifer properties and the anisotropic nature of groundwater flow in the Passaic Formation, an aquifer pump test will be conducted.
- To evaluate physical properties of the Passaic Formation collect core samples from matrix diffusion borings for testing and visual inspection of formation materials.

3.5. IDENTIFICATION OF PRELIMINARY REMEDIAL ACTION OBJECTIVES

Section 121(b) of CERCLA indicates a preference for remedial actions that permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and chemicals. The remedial action must be protective of human health and the environment, be cost effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The purpose of this section of the Work Plan is to identify potential remedial action objectives for groundwater contamination and a preliminary range of remedial action alternatives and associated technologies. It is a general classification of potential remedial actions based upon the initially identified potential exposure pathways and associated receptors identified in Section 3.3.

3.5.1. Preliminary Objectives

The remedial action objectives will prevent or mitigate the release of contamination to the surrounding environment and eliminate or minimize the potential risk to human health and the environment.

The preliminary remedial action objectives for groundwater include:

- Prevent exposure (ingestion, dermal contact, or inhalation) to groundwater with chemical concentrations exceeding available ARARs and risk-based levels developed in the BHHRA.
- Mitigate further migration of water having chemical concentrations in excess of available ARARs and the risk-based levels developed in the BHHRA.
- Remediate groundwater such that available ARARs and risk-based levels are attained at the end of the remedy, to the extent practicable.

3.5.2. Preliminary General Response Actions

To meet the above preliminary remedial action objectives, a set of general response actions was identified. The general response actions that meet the above objectives fall into the following categories:

- No action
- Limited action
- Containment
- Treatment

The development, screening, and detailed analysis of remedial alternatives are discussed in Section 5.

3.6. NEED FOR TREATABILITY STUDIES

At this time, the need for a treatability study cannot be assessed. Depending on the alternative selected in the FS, a treatability study may be needed to prove the effectiveness of the technology. Any treatability study will be conducted at the direction of the USEPA.

3.7. INTERIM REMEDIAL ACTIONS

Interim remedial actions are not proposed at this time since the contaminated groundwater does not pose an immediate threat to public health. In addition, the presence of DNAPL (Dense Non Aqueous Phase Liquid) has not been confirmed. If RI field activities indicate the presence of DNAPL, interim remedial actions will be considered at that time.

4. WORK PLAN RATIONALE

4.1. WORK PLAN APPROACH

The main objective of the RI is to characterize the nature and extent of groundwater contamination, identify migration pathways and potential receptors, and to evaluate the physical and hydraulic properties of the bedrock aquifer.

The recommended overall approach to conducting this RI includes:

- Evaluation of existing data
- Determination of additional data needs
- Data collection activities
- Sample analysis and validation
- Data evaluation
- Determination of necessity for additional data/treatability studies
- Assessment of baseline human health risks
- Report

4.2. DATA QUALITY OBJECTIVES

The DQO process is a tool that may be used to improve the quality of the data collection process by generating data that support defensible decisions. The DQO process addresses study objectives, data collection, and limits on decision errors. Implementation of the DQO process involves a seven-step data life cycle that generates a set of quantitative and qualitative statements pertaining to data collection activities (USEPA, 2000).

DQOs ensure that the quality of data for particular field activities are acceptable for the intended use of the data and also ensure precision, accuracy, reproducibility, comparability, and completeness. The DQO process is discussed further in Attachment 1.1 of the QAPP.

The FSP and the QAPP outline the detailed sampling and analytical procedures for each medium to be sampled, the number and type of each sample and the Quality Assurance/Quality Control (QA/QC) sample requirements for each medium. The DQOs for each sample type are identified in the QAPP based on the highest analytical level for the intended use of the data. The QAPP identifies precision, accuracy and completeness goals used in selecting the sampling and analysis methods. The FSP contains details of field activities, such as Standard Operating Procedures (SOPs) for well installation, and the collection of groundwater samples. These documents are submitted under separate cover from this Work Plan.

5. RI/FS TASKS

5.1. PROJECT PLANNING

The project planning task involves several subtasks that must be conducted to develop the plans and corresponding schedule necessary to execute the RI/FS. These subtasks include conducting an analysis of existing data (and developing a conceptual site model report), reviewing existing project plans, conducting a site visit, developing a preliminary risk assessment (using existing data), identifying preliminary remedial alternatives, developing DQOs, and determining preliminary ARARs. All of these activities culminate in the preparation of the final project plans. The detailed analysis of existing data, identification of preliminary ARARs, development of the preliminary risk assessment, identification of remedial action objectives and alternatives, as well as development of DQOs, are presented in Sections 3.0 and 4.0 of this Work Plan.

The project plans include the preparation of this Work Plan, FSP, QAPP, QCP, and SSHP. These plans will be submitted under separate cover.

5.2. COMMUNITY RELATIONS

The USEPA will develop a community relations program and provide community relations support for the Site with supplemental support from the USACE and Malcolm Pirnie as requested. The USEPA will coordinate the community relations program.

5.3. FIELD INVESTIGATION

The RI field investigation is being conducted to obtain valid data to fill data gaps in the historical data. The data from the RI will be used to evaluate the overall nature and extent of groundwater contamination at the Site and gain a better understanding of the physical and hydraulic properties of the aquifer so that an evaluation of remedial alternatives can be completed. The data will also be used to assess migration pathways, identify potential receptors, and evaluate potential human health risks.

5.3.1. Subcontracting

Subcontractors will be utilized for performance of specific work activities associated with the RI. Malcolm Pirnie will coordinate with the USACE Program Manager (PM) to ensure that only responsible and reputable businesses are used to conduct work on the project. Malcolm Pirnie strives to identify small businesses (preferably minority and/or woman owned businesses) in an effort to satisfy established small business subcontracting goals.

To support the proposed field activities, the following subcontracts will be required:

- A drilling subcontract for bedrock drilling and coring.
- A subcontract for fabrication and installation of temporary borehole liners and multi-port monitoring wells (i.e., Flexible Liner Underground Technologies, Ltd. Co.)
- A geophysics subcontract for a non-invasive survey (*e.g.*, magnetic, resistivity, and gravity) to mark-out utilities at proposed drilling locations on private properties.
- A laboratory subcontract for non-CLP (Contract Laboratory Program) analytical services (e.g., VOC analyses of rock samples).
- A waste disposal subcontract to remove all wastes (solid and liquid) generated during the investigation.
- A geophysics subcontract for down-hole high resolution temperature logging of the boreholes.

- A surveying subcontract for the survey of all newly installed monitoring wells and staff gauges.
- A subcontract for data validation services for validation of non-CLP data.

Selection of subcontractors will be achieved utilizing Malcolm Pirnie's Best Value Procurement Policy for Federal Projects. Subcontracts with a dollar value less than $2,500 will be referred to as a "Micropurchase". Micropurchase awards will be based on the reasonableness of the supplier's offer and competition will be sought to the maximum extent practicable. Subcontracts in excess of $2,500 but not exceeding $100,000 will be referred to as "Simplified Acquisitions" and will be solicited using a competitive bidding process from at least three firms who are believed to be responsible and responsive. Goods and services utilized in support of project requirements that have a cumulative value in excess of $100,000 will be referred to as "Major Acquisitions". At or above this monetary level, all acquisitions will utilize greater detailed source selection decision-making criteria. Individual methodology will be based on sound business practices. Certain subcontracts will need to be issued on a sole-source procurement basis due to the proprietary nature of the technology involved or significant previous Site experience (*e.g.*, non-CLP analytical services for matrix diffusion samples, FLUTe™ Liner, etc.); these subcontracts will be reviewed and approved by the USACE PM prior to execution.

5.3.2. Mobilization and Demobilization

This subtask will include field personnel orientation, equipment mobilization, marking/staking sampling locations, utility mark-outs (New Jersey One Call System), checking the mark-out ticket against the utility markings (flags) at each drilling location, and demobilization. Each field team member will attend an orientation meeting to become familiar with the history of the Site, health and safety requirements, and field procedures.

Equipment mobilization will entail securing all sampling equipment needed for the field investigation. Equipment not available at any of Malcolm Pirnie's facilities will be leased, purchased, or if necessary, fabricated. A check of available Malcolm Pirnie equipment will be conducted prior to initiating field activities. Any equipment that is needed but is not available in the inventory will be secured after notification of, and approval by, the USACE. Equipment mobilization may include (but will not be limited to) sampling, health and safety, and decontamination equipment.

The locations of proposed groundwater monitoring wells and matrix diffusion borings on public and private property will be marked in white paint one week before the start of work. New Jersey's One Call System will be called and asked to mark the location of all utilities near each proposed drilling location. A copy of the Mark-Out ticket will be obtained and kept with the field team leader during drilling activities. Three full working days after the call, each proposed drilling location will be visited to make sure that each utility on the Mark-out ticket has identified their utilities in the area. Utilities identified on the Mark-Out ticket but not identified at each location will be contacted to confirm they do not have any utilities in the area. However, New Jersey's One Call System will not identify utilities on private property. A geophysics subcontractor will perform a non-invasive survey (*e.g.*, magnetic, resistivity, and gravity) to mark-out utilities at the proposed drilling locations on private properties.

Equipment will be decontaminated and demobilized at the completion of all field activities or during the course of the field investigations, as deemed necessary. Personnel, investigation equipment, and large equipment (*e.g.*, drilling equipment) that require decontamination will be decontaminated in the contamination reduction zone identified by the requirements of the Health and Safety Plan. All other sampling equipment will be securely bagged and transported to Malcolm Pirnie's equipment facility for decontamination. In addition, the disposal of all investigation-derived waste (IDW) (*e.g.*, decontamination solutions, drill cuttings, recirculation water, and well development purge water) will be conducted during demobilization. Transportation and off-site disposal of any wastes generated during the RI field activities that are determined hazardous will be carried out by a subcontractor to Malcolm Pirnie.

5.3.3. Groundwater Well Installation

As stated previously, there are currently 12 existing shallow bedrock wells (MW-1A, MW-2A, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, and MW-12) and seven existing deep bedrock wells (ERT-1, ERT-2, ERT-3, ERT-4, ERT-5, ERT-6, and ERT-8). One additional deep bedrock well (ERT-7) was drilled and temporarily lined by USEPA in January 2008; the design and installation of a multi-port FLUTe™ system will be completed as part of the RI field program. An inspection of the 12 existing shallow bedrock wells will be conducted in order to evaluate their integrity. A drilling subcontractor may be needed to perform well repairs including, but not limited to, repairing damaged well vaults and providing new manhole covers.

In order to further delineate the nature and extent of groundwater contamination, nine new deep bedrock wells are proposed. Three will be installed at the former CDE facility and six will be installed in the surrounding vicinity. The proposed monitoring well locations are shown on Figure 5-1. The rationale for each proposed monitoring well is presented in Table 5-1. Details on the property information (e.g., tax block and lot) for the proposed locations of the new monitoring wells are provided in Table 5-2. These proposed monitoring well locations may need to be adjusted based on field conditions, agreement by the land owner, groundwater data collected from the ERT wells in August 2008, or at the discretion of the USEPA.

Three of the new monitoring well borings will be drilled using a wireline coring rig to collect 2.5-inch diameter rock cores for lithological characterization and rock matrix diffusion sampling for VOCs, PCBs, and physical properties analyses. One of these 'matrix diffusion' borings will be located at the suspected down-gradient boundary of groundwater contamination. If contaminant mass is not detected in rock samples from this down-gradient matrix diffusion boring, then a fourth matrix diffusion borings will be cored and rock samples collected. The contingent fourth matrix diffusion boring will be located closer to the former CDE facility in the area near existing well ERT-3. The remaining five new monitoring well borings will be drilled using rotary tricone methods.

A geologist will be in the immediate vicinity of drilling operations when drilling is being performed. The geologist will note depth to bedrock, changes in lithology, fracture spacing, and other rock features. Further details on drilling and monitoring well installation, including well construction and completion, are provided in Section 4.4.2 on the FSP.

The nine proposed wells will be completed as FLUTe™ Liner multi-port wells in order to be consistent with recent USEPA well installation. The advantage of a multi-port FLUTe™ system is that it protects groundwater integrity while isolating sections of a well. More specifically, a multi-port FLUTe™ system allows for direct sampling of fractures or groundwater flow zones within the well by isolating specific depths with a liner and tubing brought to the surface.

Monitoring well boring depths are estimated at 250 feet bgs, however, the matrix diffusion testing for chlorinated VOCs will dictate the actual depths of each boring. Monitoring well borings will be completed to the maximum depth of detectable concentrations of VOCs in the rock matrix diffusion samples.

Immediately upon completion of a boring, a temporary FLUTe™ Liner will be installed to minimize the length of time the monitoring well borings are open. Hydraulic profiling of the borehole will be conducted during the installation of the temporary FLUTe™ Liners to evaluate groundwater flow zones using the “liner drop” test method. The amount of time it takes to install the liner depends upon the hydraulic conductivity of the surrounding fractures. The higher the hydraulic conductivity, the easier and more quickly the liner will drop into the well. Once the liner is in place, high-resolution temperature logging will be conducted inside the temporary FLUTe™ Liner to further define groundwater flow zones.

Data collected from the "liner drop" test, high-resolution temperature logging, and rock coring and drilling observations recorded by the field geologist will be used to select the multi-port sampling intervals. Once selected, the proposed multi-port sampling intervals will be presented in tabular format to the USEPA and USACE for their review and approval.

Groundwater quality information collected from the existing shallow monitoring wells shows that the concentration of TCE is greater than 1 percent of the its solubility; therefore, there is a potential for the presence of DNAPL. As such, a temporary NAPL absorbent liner (NAPL FLUTe™ System) will be installed in three deep bedrock wells proposed to be installed on the former CDE facility. In addition, a NAPL absorbent liner will be installed in the monitoring well proposed to be installed immediately down-gradient of the facility, adjacent to ERT-2.

All investigation-derived waste (IDW), including decontamination solutions, drill cuttings, recirculation water, and well development purge water resulting from the installation and development of monitoring wells will be stored in either DOT-approved 55-gallon drums or a 21,000 portable water tank, such as a 'Frac' tank. Solid and liquid wastes will be stored in separate containers and will be permanently labeled with the date and contents. The IDW subcontractor will be responsible for sampling and analysis of the waste generated to determine proper disposal and comply with the disposal facility's requirements. The Frac Tank and 55-gallon drums will be temporarily stored on the former CDE facility at a location identified and approved by the USACE and USEPA. The method of disposal will be determined after all analytical results have been obtained. Composite samples may be collected and analyzed for RCRA waste characteristics and Toxicity Characteristic Leaching Procedure (TCLP) VOCs, SVOCs, Pesticides/Herbicides, Metals, and PCBs. The waste disposal subcontractor will dispose of IDW according to federal, state, and local regulations. Malcolm Pirnie will retain copies of the waste manifests in the project files. Appendix E of the FSP provides USEPA guidance documents on the management of IDW.

Following monitoring well installation, a survey will be conducted on each new well, as well as the existing ERT wells, to determine the elevation of the top of each well casing, protective casing, and survey pin in each well apron relative to (msl) datum (NAVD, 1929). The location of each well will also be surveyed and tied to the USGS datum and the New Jersey coordinate system using a benchmark located near the Site.

Well information including well construction records, boring/coring logs, and Forms A & B will be provided to NJDEP for all new monitoring wells.

5.3.4. Groundwater Sampling

Groundwater samples will be collected during two sampling rounds from the 19 existing monitoring wells, nine new monitoring wells installed as part of this RI, and ERT-7 (once completed as a multi-port FLUTe™ well). The “deep” monitoring wells equipped with FLUTe™ multi-port systems will be purged and sampled in accordance with Flexible Liner Underground Technologies, Ltd. L.C. sampling guidelines. All samples will be analyzed for Target Compound List/Target Analyte List (TCL/TAL) chemicals and PCB Aroclors. A limited subset of groundwater samples will also be analyzed for general water quality parameters to provide background data for use in the analysis of remedial alternatives. These two full sampling rounds will be conducted approximately three months apart to capture seasonal variations in groundwater quality. A summary of the multi-ports to be sampled for general water chemistry parameters is provided in the FSP.

A limited subset of groundwater samples will be analyzed for PCB Congeners and dioxins/furans during the second full sampling round based on the presence of PCB Aroclors in the first round of groundwater samples. A limited third sampling round will be conducted approximately three months after the second round to duplicate the PCB Congeners and dioxins/furans collected during the second sampling round.

FLUTe™ Liner Multi-Port Well Sampling Procedures – approximately 128 groundwater samples will be collected from the deep bedrock FLUTe™ Multi-Port wells during the two synoptic sampling rounds. This includes 46 sampling ports of the seven existing ERT wells installed in January 2008 and an estimated 82 sampling ports to be installed in the proposed nine deep bedrock wells and ERT-7. A detailed description of FLUTe™ Multi-Port Well Sampling Procedures is provided in the FSP.

Low Flow Sampling – Groundwater samples will be collected from the 12 shallow bedrock monitoring wells located at the former CDE facility during the two synoptic sampling rounds. The monitoring well samples will be collected in accordance with NJDEP low flow groundwater sampling procedures as described in the August 2005 NJDEP Field Sampling Procedures Manual. Prior to sampling, the wells will be purged until water quality parameters (*e.g.*, pH, specific conductance, and temperature) have stabilized. A detailed description of well purging and groundwater sampling procedures is provided in the FSP.

5.3.5. Matrix Diffusion Sampling (Bedrock Core Sampling)

The concentrations of chemical contaminants in the rock matrix will be evaluated by collecting rock core samples during drilling of four deep bedrock multi-port wells. Locations of the proposed multi-port wells are shown on Figure 5-1.

Rock core samples will be collected at two foot intervals for analysis of chlorinated VOCs and PCBs. Rock samples for physical properties such as matrix porosity, bulk density, and fraction of organic carbon will be collected on average every 20 feet. A subcontractor will conduct rock sample crushing and chlorinated VOC analyses using a mobile laboratory. The real-time measurements of chlorinated VOCs will aid in the decision making process for selection of total depths of the multi-port wells. PCB analyses will be conducted in a fixed-based laboratory and will not be used in the field for decision making. Instead the PCB data will be used later in conjunction with the chlorinated VOC data to evaluate the mass of chemicals that are contained in the rock matrix.

Rock core drilling will begin at borehole MW-20 where groundwater TCE concentrations are expected to be several orders of magnitude lower than in the core area of the plume. The VOC results of MW-20 will be discussed with USEPA and USACE prior to commencing drilling the next borehole (MW-19). Rock coring and matrix diffusion testing at MW-19 is contingent on the results of MW-20 samples. If VOCs are detected in rock samples from MW-20, then nearby borehole MW-19 will not be cored as a matrix diffusion boring. Instead, MW-19 will be drilled by conventional methods and completed as a deep multi-port FLUTe™ well. Detailed sampling procedures for the rock cores are provided in Section 4.6.3 of the FSP.

5.3.6. Water Level Measurements

Water levels will be measured in the new monitoring wells, existing monitoring wells, and three Bound Brook staff gauges (to be installed during the RI as described in Section 4.7.4 of the FSP) twice during the field investigation. The purpose of the water level measurements is to evaluate the direction of groundwater movement, vertical hydraulic gradient, seasonal or temporal fluctuations, and to assess the hydraulic connection between the bedrock water table aquifer and Bound Brook.

Hydraulic heads will be measured in multi-port monitoring wells by both manual water level meters, and pressure transducers installed within the ports. Permanent pressure transducers were installed in ERT-2, ERT-3, and ERT-4 by the USEPA during well construction. Permanent pressure transducers will also be installed in five of the proposed multi-port wells to capture changes in hydraulic heads over time due in part to: changes in pumping from public water supply wells; an aquifer pumping test proposed as part of the RI field program; and changes in recharge. Such temporal changes cannot be recognized by manually recording single water level measurements during synoptic events. Pressure transducers cannot be retroactively installed in Water FLUTe™ System multi-port wells; they must be installed during well completion. Data downloaded from pressure transducers will be used to assess background temporal changes in addition to the specific requirements of the aquifer pumping test.

Water levels at the staff gauges in Bound Brook will be directly read from the gauges to the nearest 0.01 feet. Detailed procedures for conducting water level measurements are provided in Section 4.7 of the FSP.

5.3.7. Aquifer Pumping Test

An aquifer pumping test will be conducted to evaluate the anisotropic nature of local groundwater flow in the Passaic Formation. While numerous groundwater investigations in the Passaic Formation described in published literature show that groundwater flow has historically been along the strike of the formation, preliminary screening data suggest that groundwater flow in the vicinity of the former CDE facility is instead downdip along the bedding plane.

To design a practical and efficient pumping test, data from the hydrogeologic testing planned during the RI, and described in this Work Plan and the FSP, are required. As such, specifics of the pumping test, including all parameters, cannot be determined at this time. Once the necessary hydrogeologic data are obtained, the details of the pumping test will be determined. An outline of the basic procedures for a pumping test is provided in Section 4.10.2 of the FSP.

5.3.8. Environmental Database Search

As part of the preliminary conceptual site model for OU4 developed by others, a limited file review was conducted on known contaminated sites within one quarter mile of Bound Brook in the vicinity of the former CDE facility (TetraTech, 2006). This review will be supplemented for OU3 by an environmental database search that includes a 1-mile radius around the former CDE facility.

The environmental database search will be conducted for the purpose of identifying the surrounding area's potential for contributing environmental contamination to the groundwater. This work will include a review of available federal, state, and local regulatory records applicable to identifying the area's historic land use, compliance with appropriate regulations, violations, permits, enforcement actions, etc.

Specifically, the federal database search will include the following: NPL, Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), Emergency Response Notification System (ERNS), Resource Conservation and Recovery Information System (RCRIS), Facility Index System (Finds), PCB Activity Database (Pads), RCRA Administration Action Tracking System (Raats), Toxic Release Inventory System (TRIS), Toxic Substances Control Act (TSCA), and Hazardous Materials Incident (HMIRS). State database records to be searched will include the following: Leaking Underground Storage Tank Incident Reports (LUST), Solid Waste Facilities/Landfill Sites (SWF/LS), and Registered Underground Storage Tanks (UST). Other local records may include the following: tax assessor records, planning and zoning records, health department records, and Sanborn and topographic maps.

At the conclusion of the database search, a report outlining the findings of the federal, state, and local database searches will be included in the RI report, including conclusions regarding other sources potentially contributing groundwater contamination.

5.3.9. Private Well Search

A well record search will be conducted through the NJDEP for private wells located within one mile of the former CDE facility. A summary of private wells will be provided to the USEPA and USACE and will include owner information, well locations, well depths, and pumping capacities. Upon direction by the USEPA, groundwater samples may be collected and water levels may be measured to evaluate potential impacts from the former CDE facility.

5.4. SAMPLE ANALYSIS/VALIDATION

The USEPA's FASTAC program will be used for routine groundwater analyses. An authorized requestor will request Routine Analytical Services (RAS) sample slots in the CLP via the USEPA Region 2 Regional Sample Control Coordinator (RSCC) office in Edison, New Jersey. The authorized requestor will also request sample slots with the USEPA's Region 2 DESA laboratory in Edison, New Jersey via the RSCC office.

In the event that CLP or DESA cannot accept the samples, a private laboratory will be subcontracted. Typically, only special non-CLP analytical services or fast turnaround time will preclude the use of CLP or DESA. All CLP data will be validated by the USEPA.

5.4.1. Chemical Analysis

Groundwater samples collected for TCL/TAL compounds will be analyzed through the USEPA CLP or DESA. As stated previously, all samples will be analyzed for TCL/TAL chemicals in accordance with the USEPA CLP Statement of Work for Low Concentration Water Matrix (SOM01.2). A RAS or non-RAS form will be submitted to the USEPA RSCC office at least two weeks prior to any planning sampling events. If CLP is used for any sampling event, Forms II Lite will be used and a Trip Report will be submitted within two weeks of the completion of the sampling event. Analytical Services Tracking System (ANSETS) reports for non-CLP data will also be completed upon sample completion.

Other laboratories will be subcontracted for non-routine analytical services such as rock matrix diffusion testing and geochemistry of groundwater. Rock core samples collected for chlorinated VOCs will be analyzed in a mobile laboratory by the subcontractor for non-CLP analytical services. Rock core samples will be analyzed for PCBs and will be shipped to a private subcontracted laboratory in the event CLP and/or DESA cannot perform these analyses. Rock physical properties such as matrix porosity and bulk density will be analyzed by a geotechnical laboratory subcontractor specializing in the analysis of bedrock samples.

5.4.2. Data Validation

Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in the applicable analytical methods and the laboratory Statements of Work. All TCL/TAL data generated through the CLP will be validated by RSCC using the latest applicable USEPA Region 2 validation procedures. Data generated by DESA are considered USEPA-validated and are useable as reported. No third party data validation will be performed on DESA-generated data.

Non-CLP analytical data will be validated by a subcontractor in accordance with USEPA's National Functional Guidelines and applicable Region 2 guidelines.

5.4.3. Sample Tracking

Sample tracking consists of the arrangements for and allocation to the designated CLP and non-CLP laboratories. The task includes assuring proper documentation and transportation of the samples to the laboratories and communication with the RSCC office and/or the DESA Laboratory.

Sample tracking will include the following activities:

- Scheduling RAS sample slots in the CLP with the USEPA Region 2 RSCC office in Edison, New Jersey
- Scheduling sample slots with the USEPA DESA Laboratory in Edison, New Jersey via the RSCC office

- Interacting with the RSCC, the DESA Laboratory, Sample Management Officer (SMO), field personnel, and others involved in sample collection and analysis.
- Generation of trip reports and use of Forms II Lite, and ensuring receipt of samples by the laboratories
- Organizing analytical data packages as they are received.

5.5. DATA EVALUATION

The data collected during the RI will be compiled and evaluated to allow a complete assessment of OU3 groundwater, specifically the physical and hydraulic properties of the aquifer and the nature and extent of groundwater contamination. With the exception of data from the August 2008 groundwater sampling event conducted by the USEPA, historical data will not be incorporated in this assessment. An interim data evaluation report will be prepared for each sampling round after all validated data is received. The reports will include a written summary, summary tables and figures, as well as supporting field sampling logs. The interim reports will include summaries of chemical data as well as groundwater elevation data. The first interim data report will also include recommended sampling locations for the PCB Congeners and dioxins/furans proposed for the second and third sampling rounds. Evaluating the data as it is collected will permit early identification of any data gaps and data quality issues that must be resolved prior to completing the RI. The interim data evaluation reports will be submitted to USEPA, USACE, and NJDEP.

5.6. ASSESSMENT OF RISK

A BHHRA will be conducted to characterize health risks associated with groundwater contamination that could prevail, currently and in the future, in the absence of remedial action. The assessment will follow guidance contained in the USEPA's *Risk Assessment Guidance for Superfund, Volume I, Human*

Health Evaluation Manual, Part A (USEPA, 1989b), *Part D* (USEPA, 2001a), and *Part E* (USEPA, 2004), and other related guidance.

The BHHRA will be based on groundwater data collected during the RI; historical data will be summarized in the BHRRA but will not be used in the quantitative assessment of health risks. The BHHRA will be conducted in two parts: a Pathways Analysis Report (PAR) and the BHHRA report, as follows.

<u>Pathways Analysis Report</u> - the PAR will be completed and submitted, separate from the BHHRA report, upon receipt of the validated groundwater data from the RI. The PAR, which will include RAGS Part D Tables 1 through 6, will serve as a predecessor to the BHHRA but will not be finalized upon review by the USACE and the USEPA. Comments requiring resolution will be discussed via a teleconference with the USACE and the USEPA; response-to-comments (RTCs) will be prepared for only unresolved comments. Resolved comments will be incorporated directly in the BHHRA. The PAR will include selected draft, report-ready text, figures, and appendices to facilitate the completion of the BHHRA report.

Interim deliverables (e.g., RAGS Part D Tables 1 and 4) may be provided to the USEPA risk assessor through the USEPA Remedial Project Manager (RPM), for concurrence prior to submitting the PAR.

<u>Baseline Human Health Risk Assessment Report</u> - the BHHRA will be comprised of the quantitative assessment of health risks conducted in conformance with the PAR. The BHHRA report will include RAGS Part D Tables 7 through 10, as well as all components of the PAR (*i.e.*, RAGS Part D Tables 1 through 6 and associated text, figures, and appendices).

5.6.1. Overview

The objective of the BHHRA is to characterize human health risks associated with exposure to chemicals in groundwater as it currently exists (*i.e.*, without remedial action). Current and future land uses will be considered in the assessment. Environmental release mechanisms, exposure pathways, exposure routes, and human populations were preliminarily identified in Section 3.3.

The BHHRA will follow the four-step process typically used to assess potential human health risks:

<u>Data Evaluation</u> – groundwater data from the RI will be compiled and analyzed to determine the usability of the data and to select COPCs that are representative of the contamination detected in groundwater. Per USEPA Region 2 guidance, all groundwater data will be evaluated as a single aquifer (*i.e.*, data from all monitoring wells will be combined regardless of depth). However, pending the analytical results, evaluation of a subset of the data may be deemed appropriate (*i.e.*, eliminate data from monitoring wells located along the fringes of the groundwater plume if COPCs are not detected or conduct "hot spot" evaluations if analytical data from these monitoring wells preclude the statistical estimation of exposure point concentrations). The decision process for the selection of COPCs is as follows:

- Groundwater data will be screened against the 2008 Regional Screening Levels for Chemical Contaminants at Superfund Sites, developed by Oak Ridge National Laboratory, for tap water. Consistent with USEPA Region 2 guidance, the RSLs based on non-cancer health effects will be reduced by one-tenth to represent a target hazard quotient (THQ) of 0.1. Chemicals detected at concentrations less than these criteria will not be selected as COPCs.
- All chemicals designated by the USEPA as Class A human carcinogens will be selected as COPCs, regardless of the other selection criteria.
- The essential nutrients (*i.e.*, calcium, magnesium, potassium, and sodium) will be eliminated as COPCs.
- Per USEPA guidance, for sample sizes greater than or equal to 20, if the detection frequency of a chemical is less than 5 percent and the chemical is not considered to be Site-related, it will be eliminated as a COPC.
- Chemicals that do not have screening levels will be retained as COPCs.

<u>Exposure Assessment</u> – exposure assessments will be conducted to identify actual or potential pathways of human exposure, characterize potentially exposed human populations, and where possible, quantify the exposure of affected populations. Actual or potential exposure pathways, identified by a source and mechanism of chemical release, an environmental transport medium, a point of potential contact, and an exposure route, will be evaluated. All potential exposure pathways will be identified and a rationale will be provided for the inclusion or exclusion of each pathway. An inventory of groundwater uses in the vicinity of the former CDE facility will be conducted as a component of the RI; this information will be factored into the rationale for inclusion or exclusion of a pathway.

Potentially exposed populations will be characterized with the intent of determining whether there is potential for casual contact or intake of chemicals. This characterization will include estimates of the ages of people potentially exposed at each exposure point and identification of human activity patterns that may influence exposure. Based on the current understanding of the Site, a preliminary CSEM has been prepared as Table 3-2. Possible routes of human exposure that will be evaluated include ingestion of and dermal contact with chemicals in groundwater and inhalation of chemicals in indoor air from household use of groundwater or intrusion of subsurface vapors. Evaluation of the vapor intrusion pathway will be made in conjunction with the USEPA. As presented previously, hydrogeologic investigations indicate that Bound Brook is recharging the bedrock aquifer (Foster Wheeler, 2002) and therefore does not represent a discharge point. However, additional data will be collected during the RI to determine the hydraulic connection of the bedrock aquifer to Bound Brook. Exposure pathways related to surface water and sediment will be addressed in the future as part of OU4 to be performed under separate contract.

Analysis of the groundwater pathway considers the following:

- The potential for contact with dissolved chemicals during either potable or non-potable use of the groundwater in or on residential, commercial/industrial, and other properties throughout the vicinity of the Site.

- Vapor emissions to outdoor air.

Generally, the exposure concern with potable use of groundwater is the potential for ingestion of chemicals detected in the groundwater and inhalation of and dermal contact with chemicals in the groundwater during routine household uses (*e.g.*, bathing, cleaning). Non-potable use of the groundwater may be for sanitary, process, irrigation, or other purposes. The exposure concern with non-potable use of the groundwater is the potential for dermal contact with, inhalation of, and incidental ingestion of chemicals in the groundwater.

Potentially exposed receptors include: residents (adults and children), workers (adults), and construction workers (adults).

Pending the analysis of the analytical data, estimates of exposure point concentrations (EPCs) for the COPCs in groundwater will be determined; the EPCs will be estimated using statistical evaluations to determine the appropriate 95% upper confidence limit (UCL) on the arithmetic average using the ProUCL Version 4.00.02 software. The estimates in other media (*e.g.*, outdoor air) will be derived from either numerical relationships between the chemical properties and chemicals concentration in the groundwater or from simplified screening models. Such determinations will involve evaluation of the environmental fate and transport processes operable for each chemical.

Estimates of chemical intake and exposure will be developed to portray reasonable maximum exposure (RME) that might be expected occur. Thus, the highest exposure that might reasonably be expected to occur at the Site, one that is well above the average case of exposure but within the range of possibility, will be considered. Per USEPA Region 2 guidance, if risks in excess of USEPA acceptable levels are determined for an exposure pathway, the pathway will be re-evaluated using central tendency exposure parameter values, where available, in the place of the upper-bound values used in the RME analysis.

Toxicity Assessment – also termed the dose/response assessment, the toxicity assessment serves to characterize the relationship between the magnitude of exposure and the potential that an adverse effect will occur. It involves determining whether exposure to a chemical can cause an increase in the incidence of a particular adverse health effect, and characterizing the nature and strength of the evidence of causation. The toxicity information is then quantitatively evaluated and the relationship between the dose of the chemical received and the incidence of adverse effects in the exposed population is evaluated.

The USEPA and other regulatory agencies have performed toxicity assessments for numerous chemicals. The guidance they provide will be used in the BHHRA. These include verified reference doses (RfDs) or verified reference concentrations (RfCs) for the evaluation of noncarcinogenic effects from chronic exposure to chemicals and cancer potency slope factors for the evaluation of incremental cancer risk from lifetime exposure to chemicals. For construction/utility workers whose exposure is short-term in nature (usually assumed to have occurred over a one-year period), subchronic RfDs and RfCs, where available, may be used. Sources of toxicological information and toxicity values, in order of preference consistent with current USEPA guidance include:

- Tier 1: IRIS, which is an on-line USEPA database containing current toxicity values for many chemicals that have gone through a peer review and USEPA consensus review process.
- Tier 2: Provisional Peer Reviewed Toxicity Values developed by the USEPA Office of Research and Development/National Center for Environmental Assessment/ Superfund Health Risk Technical Support Center.
- Tier 3: Additional USEPA and non-USEPA sources of toxicity information, including but not limited to the California Environmental Protection Agency toxicity values, Agency for Toxic Substances and Disease Registry

(ATSDR) minimum risk levels, and toxicity values published in the USEPA Health Effects Assessment Summary Tables (USEPA, 1997).

For COPCs without toxicological criteria, a qualitative assessment of their potential health risks will be conducted.

Risk Characterization – this step involves integrating information from the exposure assessment and the toxicity assessment in order to determine the likelihood, nature, and magnitude of adverse human health effects. The risk characterization will include an evaluation of carcinogenic and noncarcinogenic human health risks. Regulatory criteria will form the basis for the evaluation of human health risks associated with chemical exposure at the levels estimated in the exposure assessment. Human health risks associated with exposure to both individual chemicals and chemical mixtures will be evaluated.

Uncertainty Analysis – a qualitative discussion of the sources and magnitude of uncertainties in conducting a predictive, quantitative assessment will be presented in the BHHRA report.

5.7. TREATABILITY STUDIES/PILOT TESTING

At this time, the need for a treatability study or pilot test cannot be assessed. Depending on the alternative selected in the FS, a treatability study may be needed to prove the effectiveness of the technology. Any treatability study will be conducted at the direction of the USEPA.

5.8. REMEDIAL INVESTIGATION (RI) REPORT

A Draft RI Report will be prepared in accordance with the latest RI/FS guidance document (USEPA, 1988b). The report will include a summary of data collected as part of this RI. When the Draft RI Report is completed, it will be submitted to USACE and USEPA for review and comment. Following receipt of all comments, a response to comments (RTC) matrix will be prepared and the comments incorporated into a Draft Final RI Report; a teleconference will be held upon review of the RTC matrix and the Draft Final RI Report. This same process will be followed for the preparation of the Final RI Report, except a teleconference will not be conducted.

5.9. DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES

This task represents the first phase of the FS. Its purpose is to develop and select an appropriate range of remedial alternatives to be analyzed more fully in the second phase of the FS, the detailed analysis. The requirements of §300.430(e) of the NCP and pages 4-3 through 4-28 of the RI/FS guidance document (USEPA, 1988b) will be adhered to for the development and screening of the remedial action alternatives. Since the development of alternatives is fully integrated with characterization activities, the following activities will proceed under this task:

- Review of the preliminary remedial action objectives identified in Section 3.
- Review of the preliminary general response actions identified in Section 3.
- Determination of whether modifications (*e.g.*, refine, develop, change) to the preliminary remedial action objectives and preliminary general response actions are necessary to conform to the RI data.
- Identification of the volumes or media to which the identified general response actions might be applied (taking into account the requirements for protectiveness).
- Identification and screening of the remedial technologies and process options applicable to each general response action (evaluation of the universe of potentially applicable technology types and process options with respect to technical implementability in order to eliminate options that cannot be effectively implemented).

- Evaluation of process options using the criteria of effectiveness, implementability, and cost in order to select a representative process for each technology type retained for consideration (technology processes considered implementable are evaluated in greater detail before selecting one process to represent each technology type; one process is selected, if possible, for each technology type, to simplify the development and evaluation of alternatives without limiting flexibility during remedial design).
- Assembling the selected representative technologies into alternatives representing a range of treatment and chemical combinations, as appropriate (general response actions will be combined using different technology types and different media and/or areas of the Site).

As described below for certain categories of response actions, various ranges of alternatives must be included (the no action alternative will be included in every response action category):

- Actions to control source material such as DNAPL will include a range of alternatives in which the principal elements are removal or treatment that reduces the toxicity, mobility, or volume of the hazardous substance, or as appropriate, this range shall include an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing, to the degree possible, the need for long-term management. Other alternatives will be developed that remove or treat the principal threats but vary in the degree, quantities, and characteristics of removal or treatment residuals and untreated waste that must be managed. One or more alternatives will be developed that provide little or no removal or treatment but provide protection of human health by preventing or controlling exposure to hazardous substances through engineering controls.
- Actions to address dissolved groundwater contamination will include a limited number of alternatives that attain site-specific remediation levels

within different restoration time periods using one or more different technologies.

In addition, and to the extent sufficient information is available, the short and long term aspects of the following three criteria will be used to screen the defined remedial alternatives:

- Effectiveness – the degree that an alternative reduces toxicity, mobility, or volume through treatment, minimizes residual risks, affords long term protection, complies with potential ARARs, and minimizes short term impacts and time to achieve protection.
- Implementability – the technical feasibility and availability of the technologies each alternative would employ and the alternative feasibility of implementing the alternative
- Cost – the costs of construction and any long term costs to operate and maintain the alternatives.

Information available at the time of screening will be used primarily to identify and distinguish any differences among the various alternatives and to evaluate each alternative with respect to its effectiveness, implementability, and cost. Alternatives with the most favorable composite evaluation of all factors shall be retained for further consideration during the detailed analysis. However, alternatives selected for detailed analysis should, where practicable, preserve the range of treatment and containment technologies initially developed.

Innovative technologies are those that are fully developed, but lack sufficient cost or performance data. If innovative technologies are defined and are determined to offer the potential for comparable or superior performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated treatment technologies, such innovative technologies shall be carried through the screening phase.

5.10. DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This task represents the second phase of the FS. Its purpose is to evaluate the alternatives carried through the screening phase of the FS in order to provide the basis for identifying a preferred alternative for remedial action. The detailed analysis will consist of the following components:

- Identification and further definition of the alternatives selected from the screening phase (including details on volumes or media to be addressed, the technologies to be used, and any performance requirements associated with the technologies).
- An assessment and a summary profile of each alternative against the evaluation criteria.
- A comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criterion.

The performance of this task will be conducted in conformance with the methodology identified in the RI/FS guidance document (USEPA, 1988b) and other conditions specified under §300.430(e) of the NCP.

5.11. FEASIBILITY STUDY (FS) REPORT

A Draft FS Report will be prepared in accordance with Section 6 of the RI/FS guidance document (USEPA, 1988b) and will include remedial action objectives, general response actions, potential ARARs, identification and screening of technologies, and a detailed analysis of remedial alternatives. When the Draft FS Report is completed, it will be submitted to the USACE and USEPA for review and comment. Following receipt of all comments, a RTC matrix will be prepared and the comments incorporated into a Draft Final FS Report; a teleconference will be held upon review of the RTC matrix and the Draft Final FS Report. This same process will be followed for the preparation of the Final FS Report, except a teleconference will not be conducted.

5.12. POST RI/FS SUPPORT

This task includes efforts for any support to the USACE or the USEPA following submittal of the Final RI/FS Reports. This support may include technical assistance (*e.g.*, figure development, technical interpretations, discussions, etc.) during the USEPA's development of the Proposed Plan and/or the Record of Decision.

6. PROJECT SCHEDULE

The proposed schedule for the Cornell-Dubilier Electronics Superfund Site OU3 Groundwater RI/FS will be provided under separate cover to the USACE and the USEPA after written authorization to proceed with the field investigation is received.

7. PROJECT MANAGEMENT APPROACH

7.1. ORGANIZATION AND APPROACH

The Project Officer has the final responsibility for the quality of the work being performed under the contract. The Project Officer assigns a Project Manager (PM) to manage the technical and financial aspects of the project and the PM will interact directly with the USACE Project Manager (USACE PM) and the USEPA Remedial Project Manager (USEPA RPM). For OU3, PM is a shared role due to Malcolm Pirnie's involvement in three other OUs at the Site. An Administrative PM has been identified and will be responsible for all administrative aspects of the project including tracking performance and adherence to the established budget and schedule. A Technical PM has also been identified and will be responsible for the technical aspects of the project from initial planning through completion of the RI/FS report. The Technical PM has primary responsibility for planning, developing and implementing the RI/FS, including coordination among RI and FS task leaders and support staff, acquisition of engineering or specialized technical support, and other aspects of the day-to-day activities associated with the project. The Technical PM identifies staff requirements, directs and monitors site progress, and assures implementation of quality control (QC) procedures. A project organization chart along functional lines for this RI/FS is presented on Figure 7-1.

The project team members are selected for their qualifications and experience with the technical issues to be addressed at the Site. If unanticipated problems or project needs are encountered that cannot be adequately handled by this team, technical experts from other offices will be used as necessary with the USACE's and USEPA's concurrence.

The Project Quality Control Officer is responsible for ensuring that appropriate QC procedures are implemented, including acquisition of field equipment and supplies, development of the QAPP, reviews of specific tasks, QC procedures, and field sample management. A QA audit will be performed by the Project Quality Control Officer.

The RI Task Leader will work directly with the PM to develop the FSP and will be responsible for the implementation of the field investigation, interpretation and presentation of acquired data, the BHHRA, and preparation of the RI report.

The FS Task Leader will work closely with the RI Task Leader to ensure that the field investigation generates the proper type and quantity of data for use in the initial screening of remedial technologies/alternatives, detailed evaluation of remedial alternatives, and associated cost analysis. The FS Report will be developed by the FS technical group under the direction of the FS Task Leader.

The Field Team Leader, reporting to the PM, is responsible for the management of all Site operations, including the work performed by subcontractors, such as monitoring well installation and surveying. The Field Team Leader will consult and decide on issues relating to sampling activities and changes to the field sampling program. The Field Team Leader will coordinate with the RI Task Leader.

The Sample Management Officer (SMO) will ensure compliance with the USEPA RSCC requirements for CLP/DESA services and analyses. The SMO will coordinate with the Field Team Leader who will assure samples are properly collected, preserved, packaged, and shipped in accordance with USEPA guidelines.

7.2. COORDINATION WITH THE USACE, USEPA, AND NJDEP

The PM is responsible for coordinating the project with the USACE PM and the USEPA RPM. Weekly telephone contact will be maintained to provide updates on project status. All coordination activities with the NJDEP will be through the USACE and the USEPA, although direct contact between the PM and the NJDEP may be maintained, if required and approved by USACE and USEPA. A log of any direct communication with the NJDEP will be maintained and shared with USACE and USEPA as requested.

7.3. SCHEDULE CONTROL

As the project proceeds, the PM will monitor actual progress against the schedule outlined in the Work Plan, and deliverable due dates on a bi-weekly basis and update them, as necessary. The RI/FS tasks described in Section 5 of this Work Plan (when scheduled) will be tracked separately during the RI/FS work. The PM will inform the USACE PM and USEPA RPM of any known or anticipated change of project elements. If a delay occurs or is anticipated, the PM will develop and outline available methods to maintain the overall project schedule. Progress meetings will be held, as needed, to evaluate project status, discuss current items of interest, and review major deliverables such as the RI and FS reports.

7.4. QUALITY ASSURANCE

Work on this assignment will be conducted in accordance with the procedures defined in the site-specific UFP-QAPP and FSP. These documents will be prepared and submitted for review and approval concurrent with the Work Plan. Field blanks, field replicates, trip blanks, and samples for laboratory spiking and duplicates will be submitted to the laboratory as outlined in the FSP and QAPP. The desired precision and accuracy of laboratory and field data will be documented in the FSP and QAPP. Laboratory data will be validated in accordance with the USEPA Region 2 validation guidelines.

Deliverables will be reviewed by members of the project team and will include the Project Quality Consultants. The PM will coordinate these reviews and will promote frequent progress reviews during the project. The comments of the review team will be incorporated into the deliverables before review drafts are submitted to the USACE and the USEPA. Malcolm Pirnie internal quality control will be performed in accordance with the Quality Control Plan (QCP) developed for OU3, which has been submitted under separate cover.

7.5. COORDINATION WITH OTHER AGENCIES

RI activities will require coordination among numerous federal, state, and local agencies, as well as coordination with involved private organizations. Coordination activities with these agencies are as described below.

7.5.1. Federal Agencies

The USEPA is responsible for overall direction and approval of all activities for the Site. Sources of technical information may include, but are not limited to, the USEPA, the USACE, the ATSDR, the USGS, USEPA laboratories/Edison, and U.S. Department of Interior. These sources will be accessed through the USACE PM and the USEPA RPM for background information on the Site.

7.5.2. State Agencies

The state, through the NJDEP, may provide review, direction, and input for the RI/FS. The USEPA RPM will coordinate contacts with the NJDEP.

7.5.3. Local Agencies

Local agencies that may be involved include the Middlesex County, the Borough of Plainfield's departments such as planning boards, police, and fire department. The Middlesex Water Company will also be a key contact in the RI/FS effort. Contacts with local agencies will be coordinated through the USEPA RPM.

7.5.4. Private Organizations

Private organizations requiring coordination during the RI/FS may include Potentially Responsible Parties (PRPs), concerned residents in the area, and public interest groups such as environmental organizations and the press. Coordination with these interested parties will be through the USEPA RPM; Malcolm Pirnie will not have any contact with these private organizations unless expressly directed to do so by the USACE or USEPA.

8. REFERENCES

Fenneman, N.M., 1938. Physiography of Eastern United States. New York: McGraw-Hill.

Foster Wheeler Environmental Corporation, 2002 (FWENC). Final Remedial Investigation Report for Operable Unit 2 (OU-2) On-Site Soils and Buildings for Cornell-Dubilier Electronics Superfund Site – South Plainfield, Middlesex County, New Jersey.

FWENC, 2001a. Data Evaluation Report for Cornell-Dubilier Electronics Superfund Site. South Plainfield, Middlesex County, New Jersey.

FWENC, 2001b. Remedial Investigation Report for OU1, Cornell-Dubilier Electronics Superfund Site. South Plainfield, Middlesex County, New Jersey.

Herman, G.C., 2001, Hydrogeological framework of bedrock aquifers in the Newark Basin, New Jersey: in Geology in Service to Public Health, 18th Annual Meeting of the Geological Association of New Jersey, P.J. LaCombe and G.C. Herman, eds. P. 6-45.

HydroQual, 2005. Preliminary Conceptual Site Model (CSM). Cornell-Dubilier Electronics Superfund Site. South Plainfield, New Jersey.

Malcolm Pirnie, Inc., 2007. Final Soils Pre-Design Investigation Report Operable Unit 2. Cornell-Dubilier Electronics Superfund Site, South Plainfield, NJ.

Malcolm Pirnie, Inc., 2008. Revised Final Habitat Assessment Report Operable Unit 2. Cornell-Dubilier Electronics Superfund Site, South Plainfield, NJ.

Michalski, A. and Britton, R., 1997. The Role of Bedding Fractures in the Hydrogeology of Sedimentary Bedrock - Evidence from the Newark Basin, New Jersey. Ground Water, Vol. 35, No. 2, pp. 318-327.

Michalski, A., 1990. Hydrogeology of Brunswick (Passaic) Formation and implications for Groundwater Monitoring Practices. Groundwater Monitoring Review, Vol. 1, No. 4, pp. 134-43.

Michalski, A. and Klepp, G.M., 1990. Characterization of Transmissive Fractures by Simple Tracing of In-Well Flow. Ground Water, Vol. 28, No. 2, pp. 191-198.

NJDEP, 2005. Field Sampling Procedures Manual.

Parker, B.L., 2007. NGWA Fractured Rock Conference: State of the Science and Measuring Success in Remediation, September 24-26, 2007, Portland, Maine.

Tetra Tech EC, Inc., 2006. Preliminary Conceptual Site Model for Operable Unit 4 of the Cornell-Dubilier Electronics Superfund Site.

USACE, 2001. Requirements for the Preparation of Sampling and Analysis Plans, USACE, EM 200-1-3.

USGS, 1998. Geohydrology and Distribution of Volatile Organic Compounds in Ground Water in the Casey Village Area, Bucks County, Pennsylvania. Water Resources Investigations Report 98-4010.

USEPA, 2007. Contract Laboratory Program Guidance for Field Samplers, OSWER 9240. 0-44, EPA/540-R-07-06.

USEPA, 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. EPA/240/B-06/001.

USEPA, 2005. Intergovernmental Data Quality Task Force. Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. Final Version. EPA-505-B-04-900A.

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

USEPA, 2004, Region II. Record of Decision Operable Unit 2. Cornell-Dubilier Electronics, Inc. Superfund Site, South Plainfield, Middlesex County, New Jersey. September 2004

USEPA, 2001a. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments).

USEPA, 2001b. Response to Request for Information. Forwarded to Foster Wheeler Environmental Corporation by U.S. Environmental Protection Agency. 9 May 2001.

USEPA, 2001c. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. EPA/240/B-01/003.

USEPA, 2000. Guidance for the Data Quality Objectives Process, EPA QA/GA, EPA/600/R-96/005.

USEPA, 1999. USEPA Contract Laboratory Program National Functional Guidelines For Organic Data Review. OSWER 9240.1-05A-P. PB99-963506. EPA540/R-99/008.

USEPA, 1997. Health Effects Assessment Summary Tables. FY 1997 Update. EPA-540-R-97-036.

USEPA, 1989a. Guide for Conducting Treatability Studies Under CERCLA, Interim Final. EPA/540/2-89/058.

USEPA, 1989b. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Part A.

USEPA 1989c. CERCLA Compliance with Other Laws Manual: part II. Clean Air Act and Other Environmental and State Requirements. EPA/540/G-89/009.

USEPA, 1989d. Region II CERCLA Quality Assurance Manual.

USEPA, 1988a. CERCLA Compliance with Other Laws Manual, Interim Final. EPA/540-9-89-006.

USEPA, 1988b. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. EPA/540/G89/004. OSWER Directive 9355.3-01.

USEPA, 1988c. USEPA Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites. EPA/540/G-88/003, OSWER Directive 9283.1-2.

USEPA, 1987. Compendium of Superfund Field Operations Methods. EPA/540/P-December 1987.

www.city-data.com/city/South-Plainfield-New-Jersey.html

9. GLOSSARY OF ABBREVIATIONS

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substance and Disease Registry
bgs	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
CDA	Capacitor Disposal Area
CDE	Cornell-Dubilier Electronics
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COPCs	Chemicals of Potential Concern
CSL	Comprehensive Site List
CSEM	Conceptual Site Exposure Model
1,1-DCE	1,1-Dichloroethylene
1,2-DCE	1,2-Dichloroethylene
DESA	U.S. Environmental Protection Agency, Division of Environmental Science and Assessment
DNAPL	Dense Non Aqueous Phase Liquid
DQO	Data Quality Objectives
DSC	D.S.C. of Newark Enterprises Inc.
EDR	Environmental Data Resources, Inc.
EPCs	Exposure Point Concentrations
FASTAC	Field and Analytical Services Teaming Advisory Committee
FS	Feasibility Study

FSP	Field Sampling Plan
FWENC	Foster Wheeler Environmental Corporation
IDW	Investigation-Derived Waste
IGWSCC	Impact to Groundwater Soil Cleanup Criteria
IRIS	Integrated Risk Information System
LTTD	Low Temperature Thermal Desorption
MCLs	Maximum Contaminant Levels
msl	Mean Sea Level
MW	Monitoring Well
NAPL	Non Aqueous Phase Liquid
NCP	National Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PAR	Pathways Analysis Report
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PDI	Pre-Design Investigation
pg/g	Picogram / Gram
pg/L	Picogram / Liter
PHHRA	Preliminary Human Health Risk Assessment
PM	Project Manager
ppm	Parts Per Million
QA/QC	Quality Assurance / Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCP	Quality Control Plan
RCRA	Resource and Conservation and Recovery Act
RfC	Reference Concentrations

RfD	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RME	Reasonable Maximum Exposure
RPM	Remedial Project Manager
ROD	Record of Decision
RSCC	Regional Sample Control Center
RSL	Regional Screening Level
RTC	Response to Comments
Site	Cornell-Dubilier Electronics Superfund Site
SMO	Sample Management Officer
SSHP	Site-Specific Safety and Health Plan
SVOC	Semi Volatile Organic Chemical
TBCs	To Be Considered Criteria
TCA	Trichloroethane
TCE	Trichloroethylene
TCL/TAL	Target Compound List/Target Analyte List
UFP-QAPP	Uniform Federal Policy for Quality Assurance Policy Plans
µg/Kg	Microgram / Kilogram
µg/L	Microgram / Liter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound

TABLES

TABLE 3-1
PRELIMINARY CHEMICALS OF POTENTIAL CONCERN
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

CAS #	Chemical	Frequency of Detection	Range of Detected Concentrations µg/L	Risk-Based Screening Levels[1] µg/L		Potential ARARs Screening Levels[2] µg/L	Preliminary COPC[3]
Volatile Organics							
67-64-1	Acetone	6 / 79	4 -- 147	2,200	nc	6,000	NO
71-43-2	Benzene	3 / 79	1.59 -- 2.11	0.41	ca	1	YES
108-90-7	Chlorobenzene	5 / 79	12.8 -- 68.3	9.1	nc	50	YES
67-66-3	Chloroform	1 / 79	1.65	0.19	ca	70	YES
95-50-1	1,2-Dichlorobenzene	4 / 79	2.17 -- 5.99	37	nc	600	NO
541-73-1	1,3-Dichlorobenzene	4 / 79	2.8 -- 21.2	NA		600	YES
106-46-7	1,4-Dichlorobenzene	4 / 79	12.2 -- 48	0.43	ca	75	YES
75-35-4	1,1-Dichloroethylene	5 / 79	3.86 -- 22.5	34	nc	1	YES
156-59-2	cis-1,2-Dichloroethylene	50 / 79	1.36 -- 242000	37	nc	70	YES
156-60-5	trans-1,2-Dichloroethylene	3 / 79	21.5 -- 55.7	11	nc	100	YES
594-20-7	2,2-Dichloropropane	1 / 50	1.63	NA		NA	YES
591-78-6	2-Hexanone	1 / 50	3.29	NA		300	YES
1634-04-4	Methyl tert-butyl ether	10 / 50	2.79 -- 116	12	ca	70	YES
108-10-1	4-Methyl-2-Pentanone	1 / 50	2.14	200	nc	400	NO
127-18-4	Tetrachloroethylene	14 / 79	1.26 -- 3420	0.11	ca	1	YES
108-88-3	Toluene	23 / 79	1 -- 59.5	230	nc	600	NO
87-61-6	1,2,3-Trichlorobenzene	3 / 64	1.25 -- 26.4	NA		NA	YES
120-82-1	1,2,4-Trichlorobenzene	8 / 79	1.91 -- 1200	0.82	ca	9	YES
79-00-5	1,1,2-Trichloroethane	1 / 79	24.2	0.24	ca	3	YES
79-01-6	Trichloroethylene	70 / 79	1.27 -- 186000	1.7	ca	1	YES
75-01-4	Vinyl chloride	10 / 79	1 -- 209	0.016	ca	1	YES
--	p,m-Xylene	4 / 50	1.47 -- 1.72	20	nc	1,000	NO
Semi Volatile Organics							
117-81-7	Bis(2-ethylhexyl)phthalate	1 / 15	1	4.8	ca	3	NO
87-68-3	Hexachlorobutadiene	2 / 50	1.48 -- 9	0.86	ca	1	YES
91-20-3	Naphthalene	2 / 79	4 -- 5	0.14	nc	300	YES

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PRELIMINARY CHEMICALS OF POTENTIAL CONCERN
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

CAS #	Chemical	Frequency of Detection	Range of Detected Concentrations µg/L	Risk-Based Screening Levels[1] µg/L		Potential ARARs Screening Levels[2] µg/L	Preliminary COPC[3]
Pesticides							
309-00-2	Aldrin	11 / 15	0.022 -- 1.3	0.004	ca	0.04	YES
319-85-7	beta-BHC	1 / 15	0.016	0.037	ca	0.04	NO
319-86-8	delta-BHC	1 / 15	0.074	NA		100	YES
76-44-8	Heptachlor	1 / 15	0.13	0.015	ca	0.05	NO
PCBs and Dioxins/Furans							
11141-16-5	Aroclor 1232	10 / 15	0.53 -- 80	0.0068	ca	0.5[4]	YES
11097-69-1	Aroclor 1254	4 / 15	4.1 -- 9.2	0.034	ca	0.5[4]	YES
--	Total PCB congeners[5,6]	3 / 3	0.0038 -- 0.37	0.0068	ca	0.5[4]	YES
--	Total 2,3,7,8-TCDD TEQ[7]	2 / 4	0.0000025 -- 0.00043	0.00000052	ca	0.00001	YES
Inorganics							
7429-90-5	Aluminum	15 / 15	37.3 -- 747	3700	nc	50	NO
7440-36-0	Antimony	1 / 15	3	1.5	nc	6	NO
7440-38-2	Arsenic	2 / 15	3.4 -- 5.6	0.045	ca	3	YES
7440-39-3	Barium	15 / 15	79.4 -- 1610	730	nc	2,000	YES
7440-41-7	Beryllium	11 / 15	0.21 -- 0.33	7.3	nc	1	NO
7440-70-2	Calcium	30 / 30	19500 -- 128000	NA		NA	NO
7440-47-3	Chromium	13 / 15	3.8 -- 18	NA		70	YES
7440-48-4	Cobalt	8 / 15	0.66 -- 2.7	1.1	nc	100	YES
7440-50-8	Copper	15 / 15	2.1 -- 36.9	150	nc	1,300	NO
57-12-5	Cyanide	10 / 15	0.98 -- 5.6	73	nc	100	NO
7439-89-6	Iron	15 / 15	76.7 -- 1210	2600	nc	300	YES
7439-95-4	Magnesium	30 / 30	7570 -- 29000	NA		NA	NO
7439-96-5	Manganese	15 / 15	36.4 -- 2570	88	nc	50	YES

TABLE 3-1
PRELIMINARY CHEMICALS OF POTENTIAL CONCERN
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

CAS #	Chemical	Frequency of Detection	Range of Detected Concentrations µg/L	Risk-Based Screening Levels[1] µg/L		Potential ARARs Screening Levels[2] µg/L	Preliminary COPC[3]
Inorganics (Continued)							
7439-97-6	Mercury	2 / 15	0.11 -- 0.16	0.063	nc	2	YES
7440-02-0	Nickel	15 / 15	3.2 -- 42	73	nc	100	NO
7440-09-7	Potassium	15 / 15	1080 -- 7490	NA		NA	NO
7782-49-2	Selenium	1 / 15	4.5	18	nc	40	NO
7440-23-5	Sodium	15 / 15	13100 -- 43800	NA		50,000	NO
7440-62-2	Vanadium	14 / 15	1.3 -- 8.5	26	nc	NA	NO
7440-66-6	Zinc	10 / 15	1.5 -- 44.6	1100	nc	2,000	NO

1 = Risk-Based Screening Levels are the USEPA Region 3 Regional Screening Levels for tapwater (12 Sep 2008) accessed online at www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm. Consistent with USEPA Region 2 guidance, screening levels based on non-cancer health effects were reduced by one-tenth to represent a target hazard quotient (THQ) of 0.1.

2 = Potential ARARS, selected as the lowest of the Federal MCLs (40 CFR 141), State MCLs (N.J.A.C. 7:10-5.2 & 7.2), and the NJ Groundwater Quality Criteria (N.J.A.C. 7:9C) .

3 = All chemicals exceeding either screening level or without screening levels were selected as preliminary COPCs except the essential nutrients (*i.e.* , calcium, magnesium, potassium, and sodium).

4 = The Potential ARAR is for Total PCBs.

5 = Excludes the PCB congeners with dioxin-like toxicity included in the total 2,3,7,8-TCDD TEQ (*i.e.* , PCB-77, -81, -126, -169, -105, -114, -118, -123, -156, -157, -167, -189, -170, and -180).

6 = The screening level is for Aroclor 1232.

7 = Includes dioxins, furans, and PCBs listed in Section 2.3.5 of the Regional Screening Levels.
NA = Not Available.
nc = non cancer.
ca = cancer.

TABLE 3-2
CONCEPTUAL SITE EXPOSURE MODEL
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Groundwater	Groundwater	Within and Outside the Boundaries of the Former CDE Facility	Worker	Adult	Ingestion	Quant	Potable and/or sanitary use of the groundwater is
						Dermal Contact	Quant	Potable and/or sanitary use of the groundwater is
						Inhalation	Quant	Potable and/or sanitary use of the groundwater is
				Resident	Adult	Ingestion	Quant	Potable and/or sanitary use of the groundwater is
						Dermal Contact	Quant	Potable and/or sanitary use of the groundwater is
						Inhalation	Quant	Potable and/or sanitary use of the groundwater is
					Child	Ingestion	Quant	Potable and/or sanitary use of the groundwater is
						Dermal Contact	Quant	Potable and/or sanitary use of the groundwater is
						Inhalation	Quant	Potable and/or sanitary use of the groundwater is
				Construction/Utility Worker	Adult	Ingestion	Qual	Shallow or perched groundwater was removed during remedial activities for OU2. Direct contact with bedrock groundwater is unlikely during construction
						Dermal Contact	Qual	Shallow or perched groundwater was removed during remedial activities for OU2. Direct contact with bedrock groundwater is unlikely during construction
		Air	Area Surrounding the Former CDE Facility - Vapors in Indoor Air	Worker	Adult	Inhalation	None	Volatile chemicals in groundwater may enter indoor spaces through cracks in building foundations. However, this exposure pathway is being addressed by the USEPA separate from the RI.
				Resident	Adult	Inhalation	None	Volatile chemicals in groundwater may enter indoor spaces through cracks in building foundations. However, this exposure pathway is being addressed by the USEPA separate from the RI.
					Child	Inhalation	None	Volatile chemicals in groundwater may enter indoor spaces through cracks in building foundations. However, this exposure pathway is being addressed by the USEPA separate from the RI.
			Area Surrounding the Former CDE Facility - Vapors in Outdoor Air	Worker	Adult	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to outdoor air.
				Resident	Adult	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to
					Child	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to
				Construction/Utility Worker	Adult	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to outdoor air.
		Surface Water/ Sediment	Bound Brook	Recreationalist	Adolescent	Ingestion	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Dermal Contact	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Inhalation	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
	Surface Water/ Sediment	Surface Water/ Sediment	Bound Brook	Recreationalist	Adolescent	Ingestion	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Dermal Contact	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Inhalation	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
		Biota	Bound Brook	Recreationalist	Adolescent	Ingestion	None	Exposure pathways related to surface water and sediment will be addressed in OU4.

TABLE 3-2
CONCEPTUAL SITE EXPOSURE MODEL
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	Within and Outside the Boundaries of the Former CDE Facility	Worker	Adult	Ingestion	Quant	Potable and/or sanitary use of the groundwater is
						Dermal Contact	Quant	Potable and/or sanitary use of the groundwater is
						Inhalation	Quant	Potable and/or sanitary use of the groundwater is
				Resident	Adult	Ingestion	Quant	Potable and/or sanitary use of the groundwater is
						Dermal Contact	Quant	Potable and/or sanitary use of the groundwater is
						Inhalation	Quant	Potable and/or sanitary use of the groundwater is
					Child	Ingestion	Quant	Potable and/or sanitary use of the groundwater is
						Dermal Contact	Quant	Potable and/or sanitary use of the groundwater is
						Inhalation	Quant	Potable and/or sanitary use of the groundwater is
				Construction/Utility Worker	Adult	Ingestion	Qual	Shallow or perched groundwater was removed during remedial activities for OU2. Direct contact with bedrock groundwater is unlikely during construction
						Dermal Contact	Qual	Shallow or perched groundwater was removed during remedial activities for OU2. Direct contact with bedrock groundwater is unlikely during construction
		Air	Within and Outside the Boundaries of the Former CDE Facility - Vapors in Indoor Air	Worker	Adult	Inhalation	None	Volatile chemicals in groundwater may enter indoor spaces through cracks in building foundations. However, this exposure pathway is being addressed by the USEPA separate from the RI.
				Resident	Adult	Inhalation	None	Volatile chemicals in groundwater may enter indoor spaces through cracks in building foundations. However, this exposure pathway is being addressed by the USEPA separate from the RI.
					Child	Inhalation	None	Volatile chemicals in groundwater may enter indoor spaces through cracks in building foundations. However, this exposure pathway is being addressed by the USEPA separate from the RI.
			Within and Outside the Boundaries of the Former CDE Facility - Vapors in Outdoor Air	Worker	Adult	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to outdoor air.
				Resident	Adult	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to
					Child	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to
				Construction/Utility Worker	Adult	Inhalation	Quant	Volatile chemicals in groundwater may volatilize to outdoor air.
		Surface Water/ Sediment	Bound Brook	Recreationalist	Adolescent	Ingestion	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Dermal Contact	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Inhalation	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
	Surface Water/ Sediment	Surface Water/ Sediment	Bound Brook	Recreationalist	Adolescent	Ingestion	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Dermal Contact	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
						Inhalation	None	Exposure pathways related to surface water and sediment will be addressed in OU4.
		Biota	Bound Brook	Recreationalist	Adolescent	Ingestion	None	Exposure pathways related to surface water and sediment will be addressed in OU4.

TABLE 5-1
RATIONALE FOR ROCK CORE BORINGS AND MULTI-PORT MONITORING WELLS
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

Proposed		Rationale
Well	Test/s	
MW-13	Groundwater	Approximately in the direction of bedrock strike along Transect-A. Characterize groundwater in lateral plume fringe or boundary to the east of the former CDE facility. Also provide eastern boundary for mass discharge estimate along plane perdendicular to the assumed direction of groundwater flow (Transect C).
MW-14	Rock matrix & groundwater	Mid-Transect-A near MW-11 (TCE = 186,000 ppb, January 2008). Characterize rock matrix and groundwater from location of highest TCE in shallow groundwater.
MW-15	Groundwater	Southeast end of Transect-A. Characterize groundwater from near MW-08 (TCE = 19,000 ppb, January 2008).
MW-16	Rock matrix & groundwater	Transect-B along possible centerline of plume. Characterize rock matrix and groundwater to aid estimates of mass discharge. Also provides rock matrix and groundwater data for mass discharge across Transect-C.
MW-17	Groundwater	Near ERT-2. Characterize groundwater immediately downgradient of northwestern property boundary, and together with MW-13, MW-16, and MW-18 (Transect-C), enable estimates of contaminant mass discharge (i.e., along plane perpendicular to the assumed direction of groundwater flow).
MW-18	Groundwater	West of the former CDE facility along strike. Characterize groundwater in lateral distal plume fringe or boundary zone, and deeper than currently sampled in ERT-5. Also provide western boundary for mass discharge estimate along plane perdendicular to the assumed direction of groundwater flow (Transect C).
MW-19	Rock matrix & groundwater	Transect-B along possible center of plume downgradient from the former CDE facility. Characterize rock matrix (only if chlorinated VOCs are not detected in MW-20 bedrock samples) and groundwater.
MW-20	Rock matrix & groundwater	Transect-B, distal from former CDE facility, along possible center of plume. Characterize groundwater downgradient from former CDE facility. Closest well to Spring Lake water supply wells.
MW-21	Groundwater	Northwest of former CDE facility and ERT-4. Characterize groundwater in lateral distal plume fringe or boundary zone.

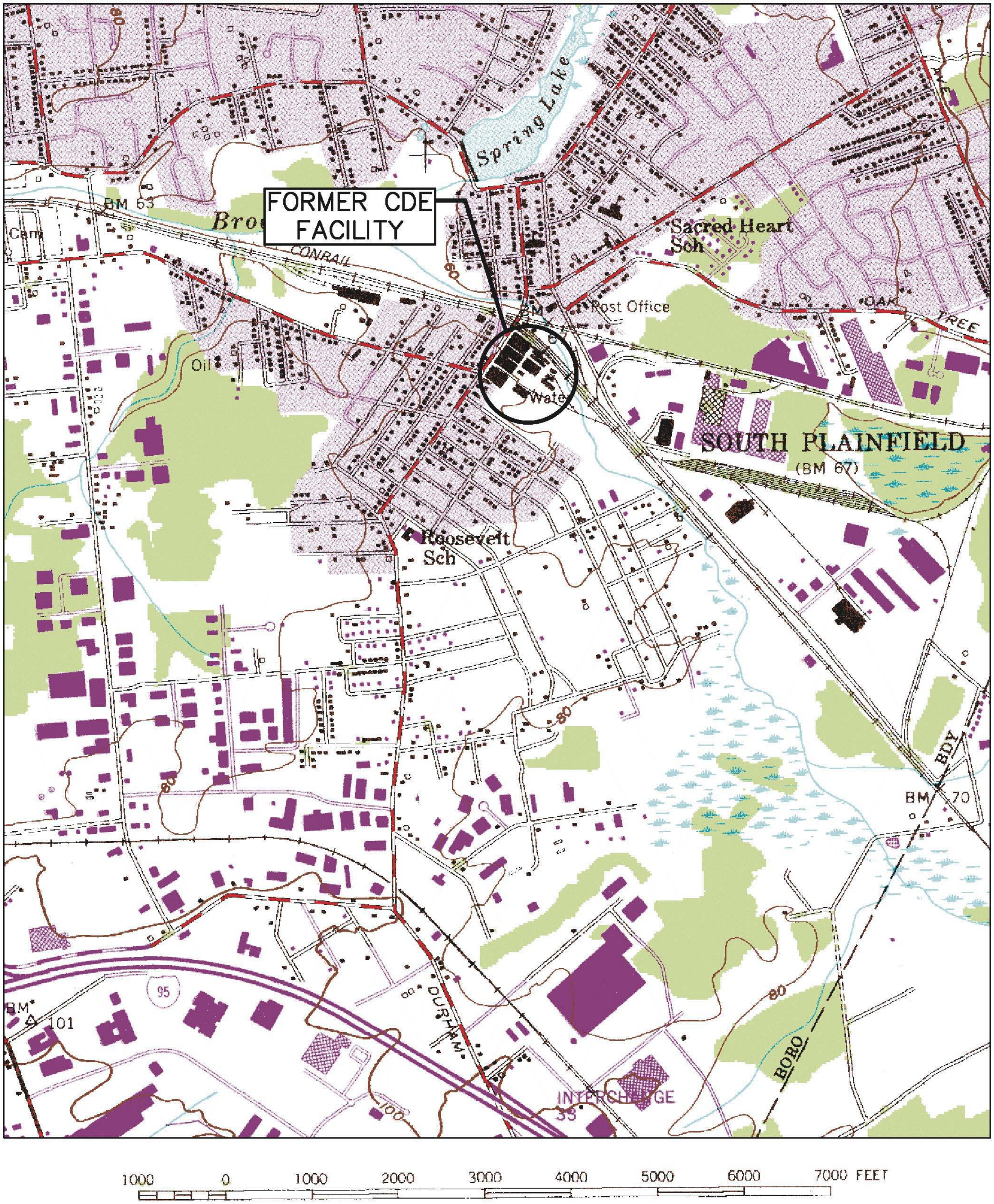
Note: Transects A through C are shown on Figure 3-1.
Transect-A. Oriented approximately parallel to strike, NE-SW through MW-11 (the highest TCE values in shallow bedrock).
Transect-B. Oriented approximately down-dip, NW-SE through MW-11.
Transect-C. MW-13, MW-16, MW-17, and MW-18. This will be used to estimate mass discharge from the former CDE facility.

TABLE 5-2
PROPOSED LOCATIONS FOR MULTI-PORT MONITORING WELLS
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

Proposed Monitoring Well	Block	Lot	Address
MW-13	257	1	Metuchen Ave.
MW-14	Former Cornell-Dubilier Electronics Facility		
MW-15	Former Cornell-Dubilier Electronics Facility		
MW-16	Former Cornell-Dubilier Electronics Facility		
MW-17	329	13	116 New Market Ave.
MW-18	315	52.01	Pitt Street
MW-19	260	10	000 Church Street
MW-20	264	5.01	112-118 Hamilton Blvd
MW-21	382	15.01	Elm & Kaine Streets

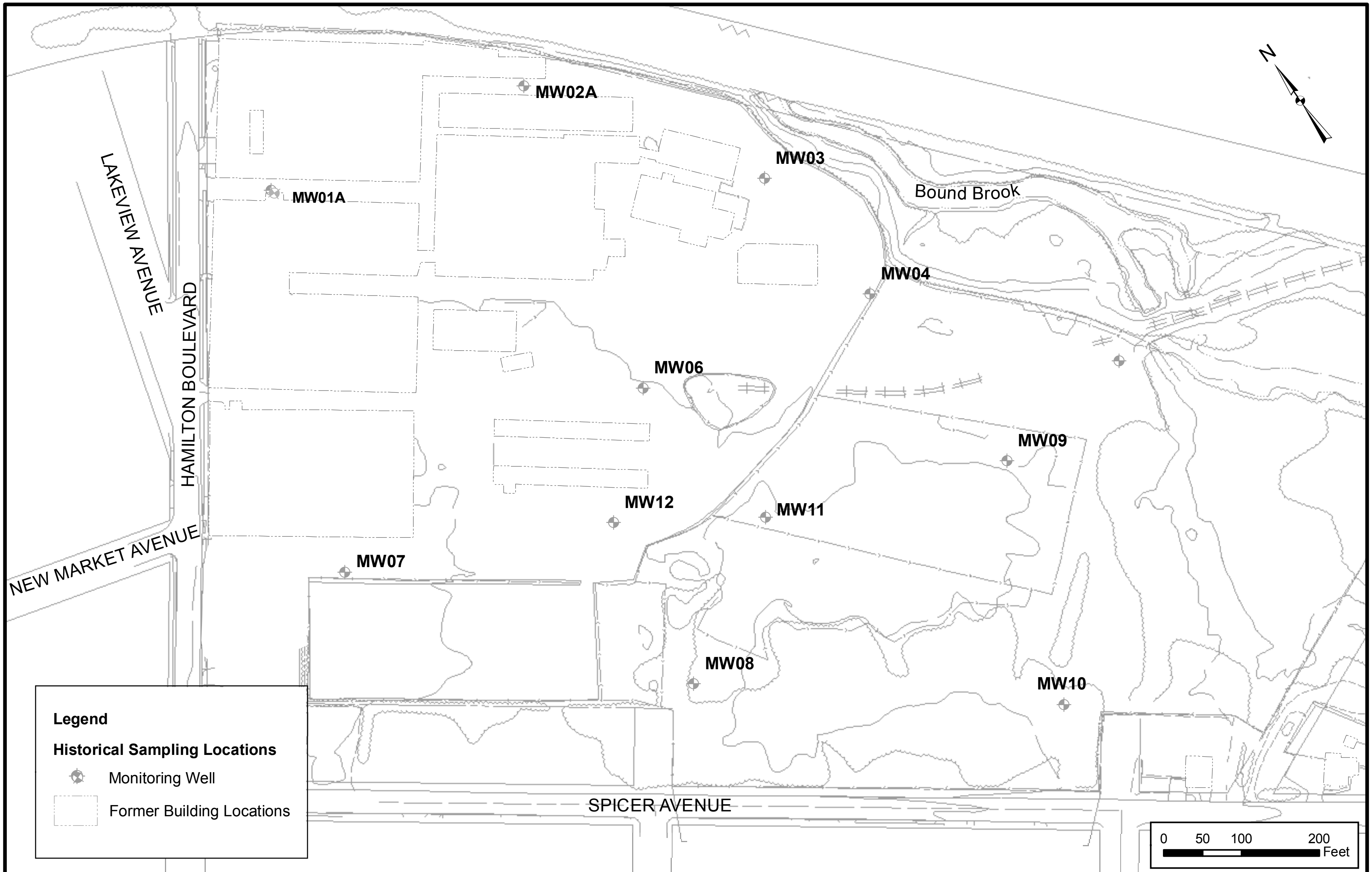
All properties are in South Plainfield, Middlesex County, New Jersey.

FIGURES



SOURCE: U.S.G.S. TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, PLAINFIELD, NEW JERSEY
QUADRANGLE, 1955, PHOTOREVISED 1981

MALCOLM PIRNIE	U.S. ARMY CORPS OF ENGINEERS CORNELL–DUBILIER SUPERFUND SITE SOUTH PLAINFIELD, NEW JERSEY CONTRACT NO. W912DQ–06–D–0006	FORMER CDE FACILITY LOCATION MAP SCALE AS NOTED	MALCOLM PIRNIE, INC. OCTOBER 2008 FIGURE 2–1



Map Document: (S:\Projects\4553023\siteplan_oct08.mxd)
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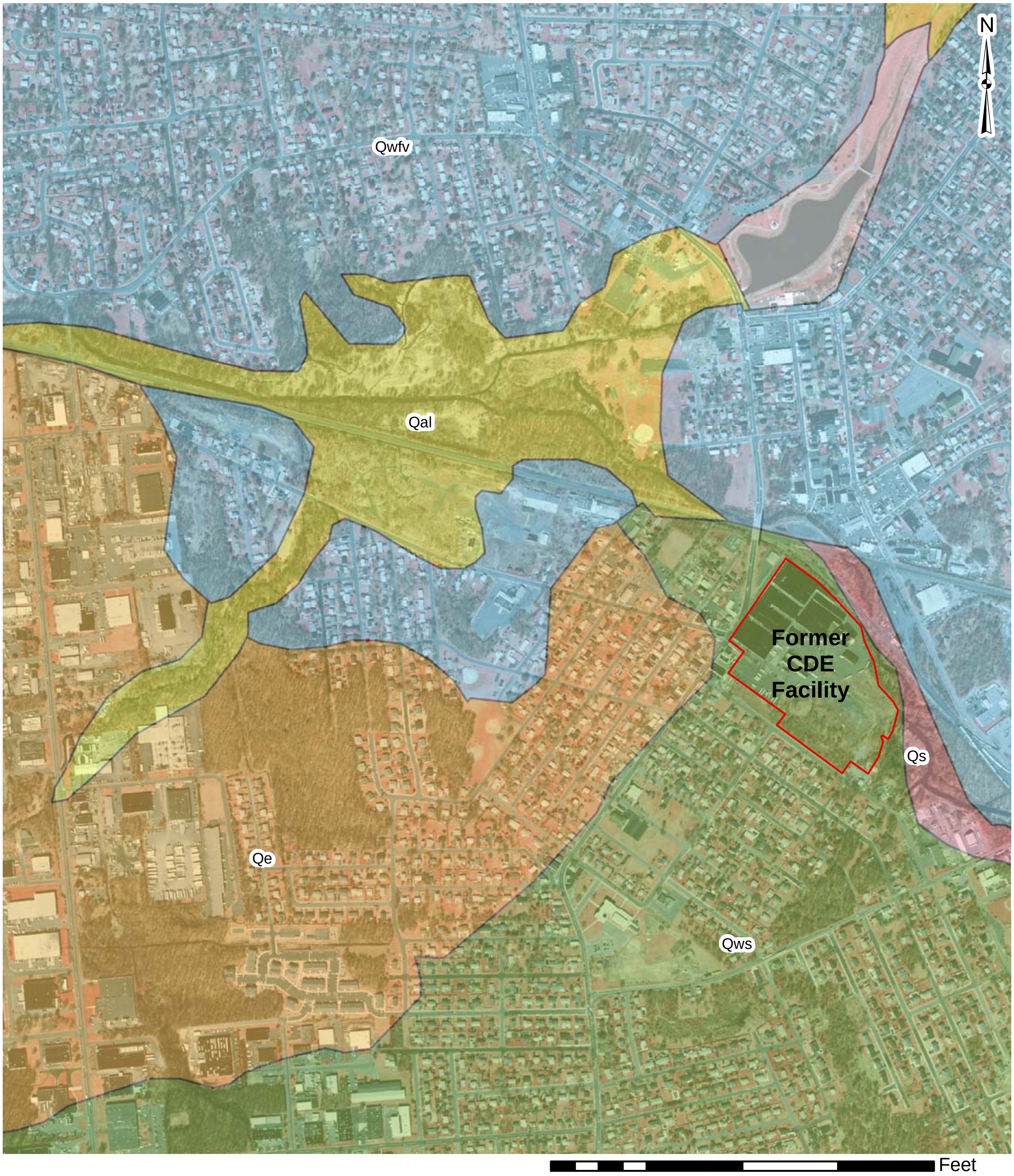
MALCOLM PIRNIE	CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE SOUTH PLAINFIELD, NEW JERSEY	FORMER CDE FACILITY PLAN	MALCOLM PIRNIE, INC. December 2008 FIGURE 2-2

R2-0000399



Qal = Alluvium
Qe = Eolian Deposits
Qs = Swamp and Marsh Deposits
Qwfv = Late Wisconsinan Glaciofluvial Plain Deposits
Qws = Weathered Shale, Mudstone, and Sandstone

Source: NJDEP GIS Database

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	Surface Geology Map	MALCOLM PIRNIE, INC. December 2008 FIGURE 3-1

Map Document: (P:\4553058\GIS\Cornell Figure mxd in 9.1\Surface_Geo_Map.mxd)
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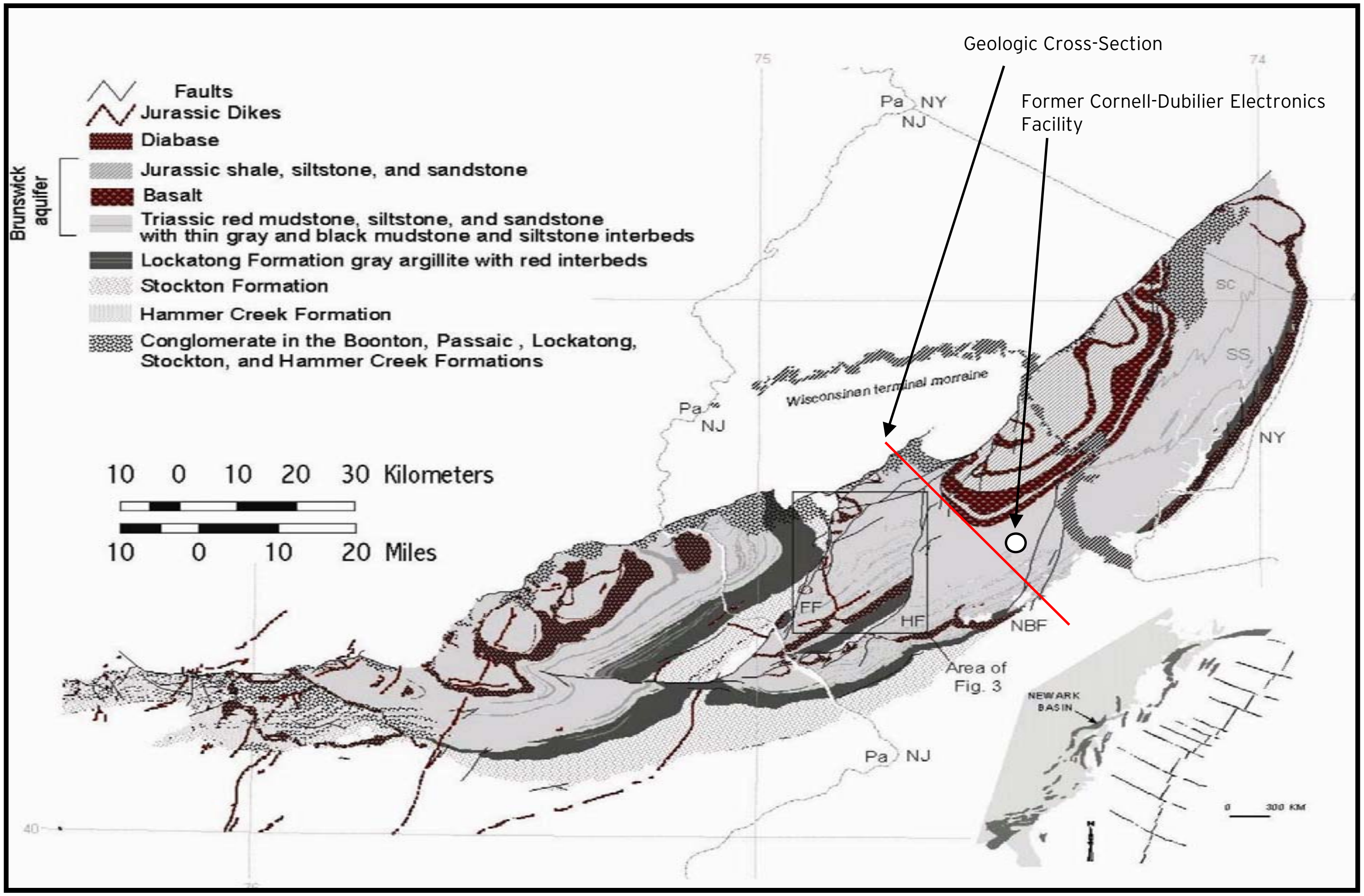
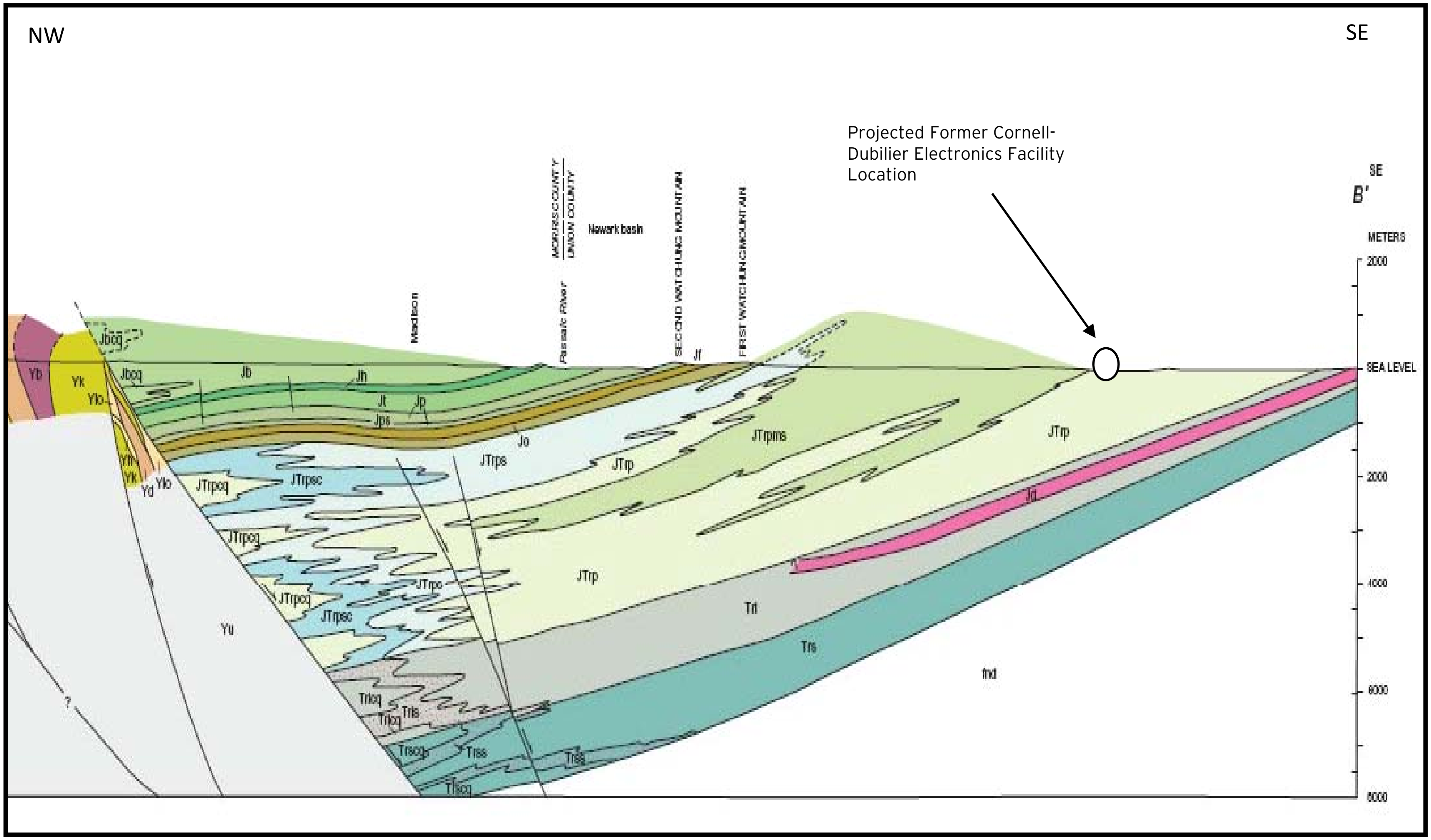


Source: Herman, 2001

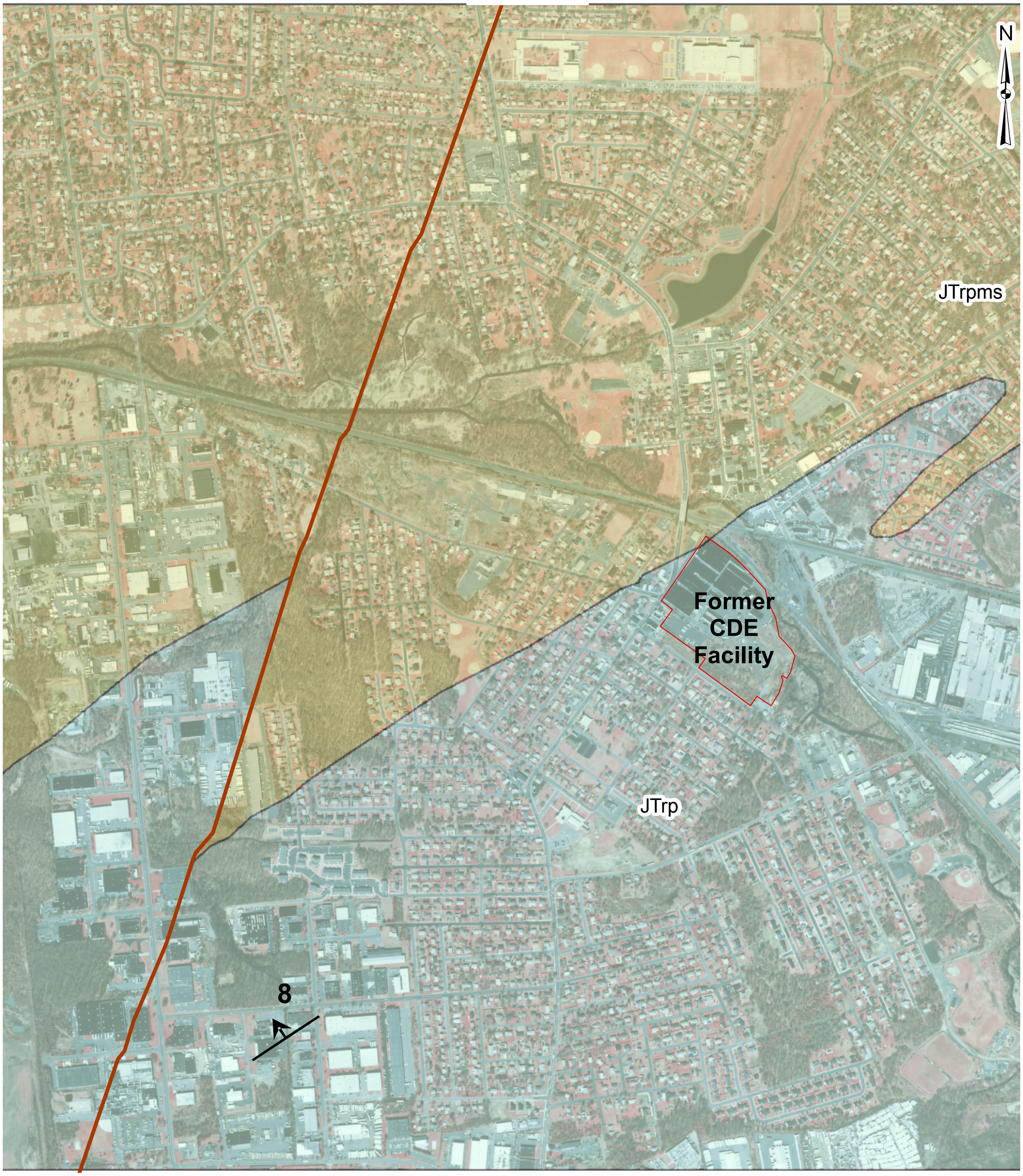
MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	Generalized Geologic Map of the Newark Basin	MALCOLM PIRNIE, INC. December 2008 FIGURE 3-2



Source: NJDEP GIS Database

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	Cross-Section of a Selected Portion of the Newark Basin	MALCOLM PIRNIE, INC. December 2008 FIGURE 3-3

R2-0000402



Feet
0 500 1,000 2,000 3,000 4,000

JTrp = Passaic Formation
JTrpma = Passaic Formation Mudstone Facies

Fault

Strike and Dip of Bedding

Source: NJDEP GIS Database

Map Document: (P:\4553058\GIS\Bedrock_Map1.mxd)
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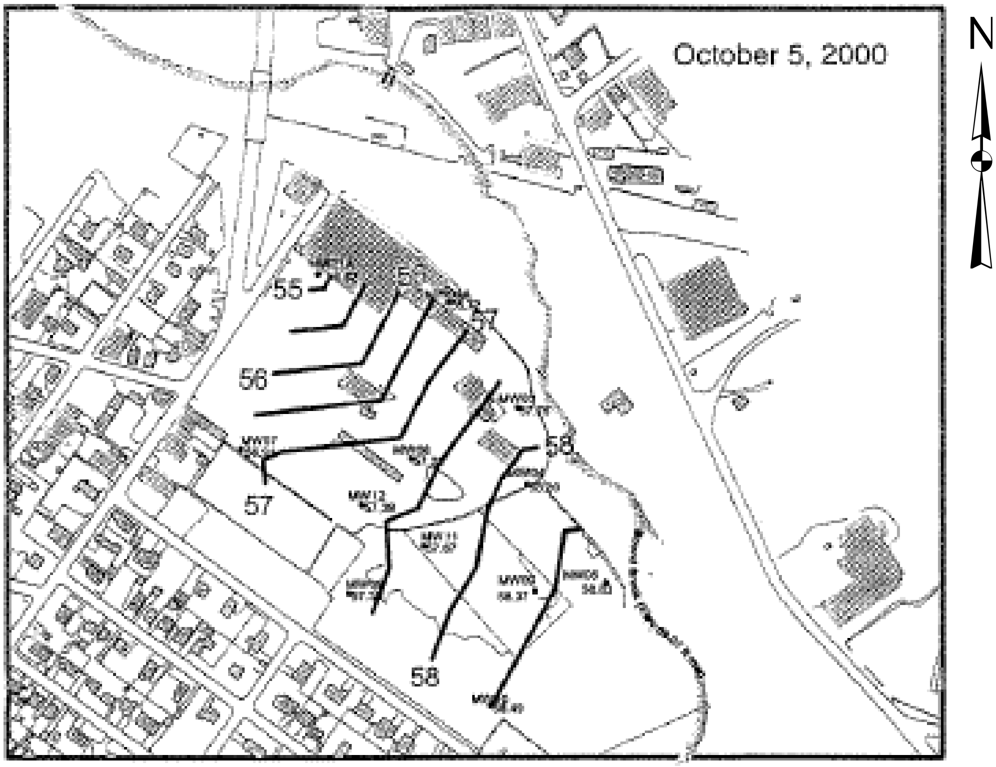
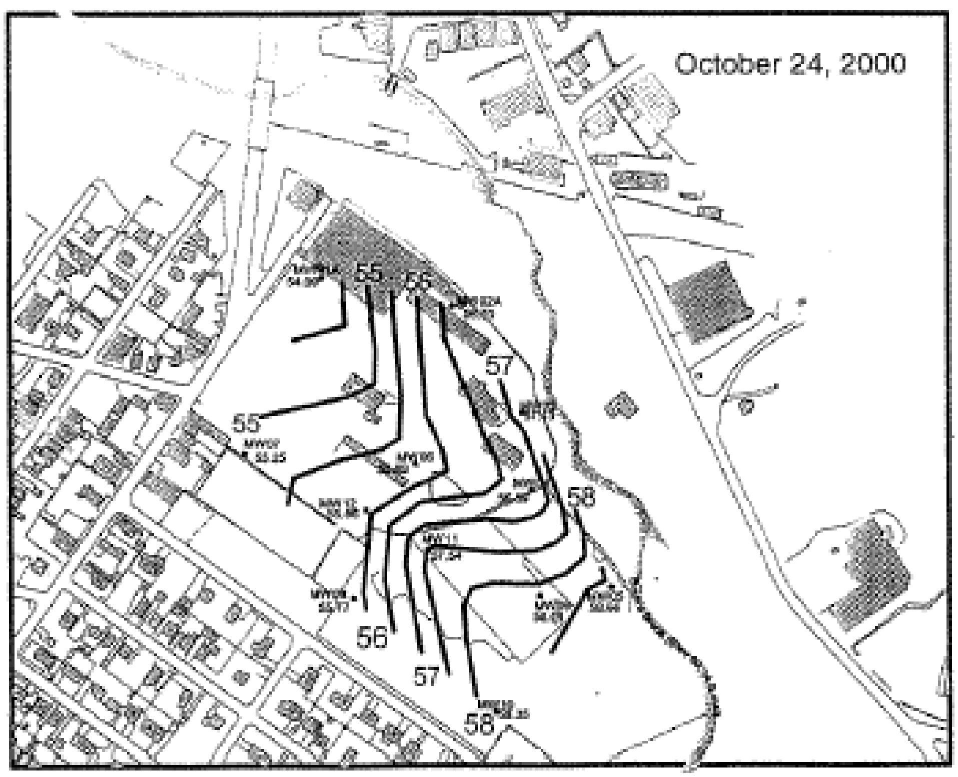
MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	Bedrock Geologic Map	MALCOLM PIRNIE, INC. December 2008 FIGURE 3-4

R2-0000403





Source: Foster Wheeler Data Evaluation Report March 2001

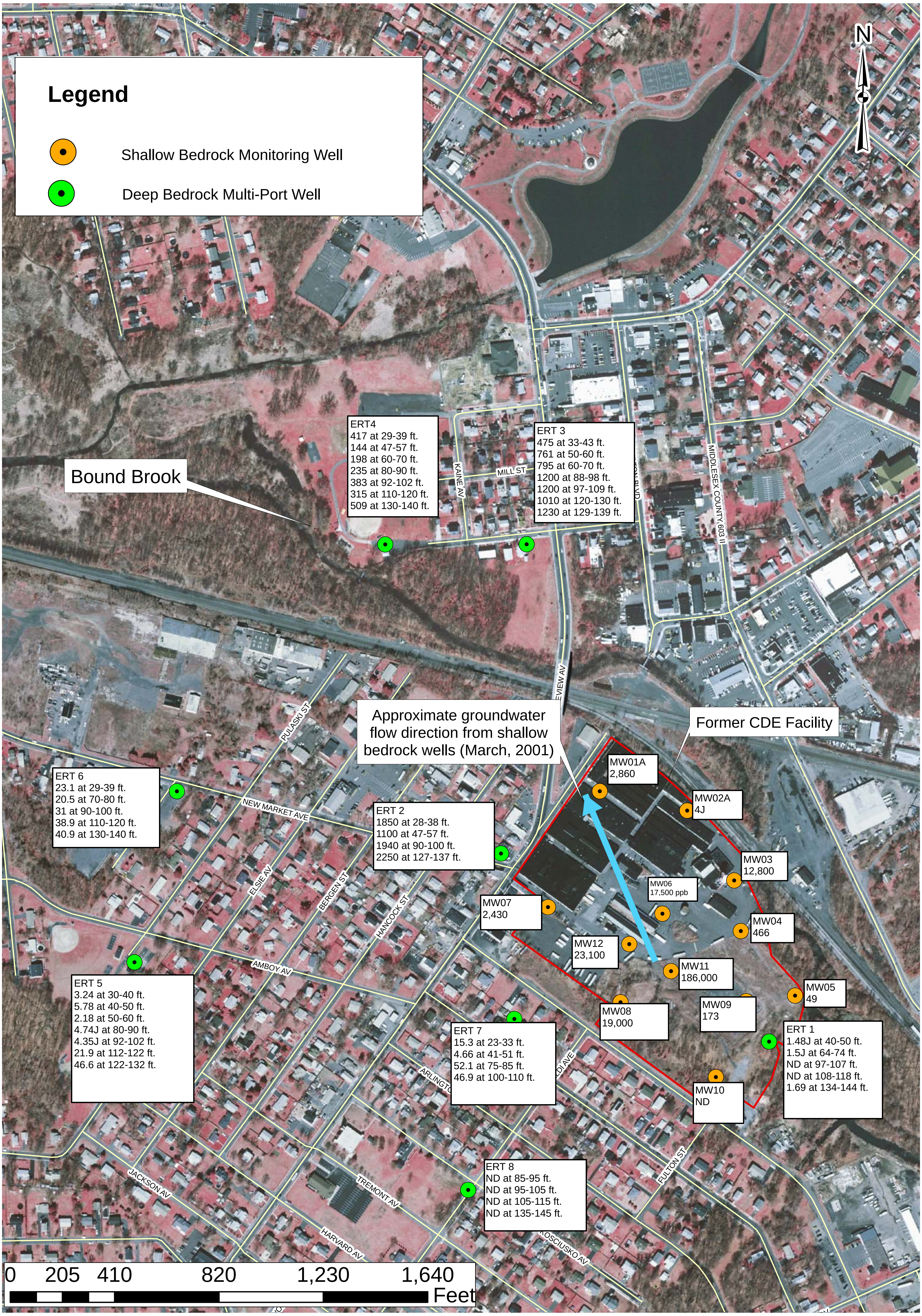
MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site
South Plainfield, New Jersey

Bedrock Aquifer Potentiometic Surfaces

MALCOLM PIRNIE, INC.

Figure 3-5



Note: Data represents packer test samples (ERT wells) and low flow sampling (MW wells).
TCE results in parts per billion (ppb) rounded to nearest significant figure.
J = Estimated Value. ND = Not Detected

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	Trichloroethene in Groundwater January 2008 Investigation	MALCOLM PIRNIE, INC. December 2008 FIGURE 3-6

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R2-0000405

MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

South Plainfield, New Jersey

Locations of Proposed Rock Cores & Monitoring Wells

MALCOLM PIRNIE, INC.

December 2008

FIGURE 5-1

Map Document: (P:\4553058\GIS\Cornell Figure mxds in 9.1\Proposed_Wells_With_Lables1.mxd)
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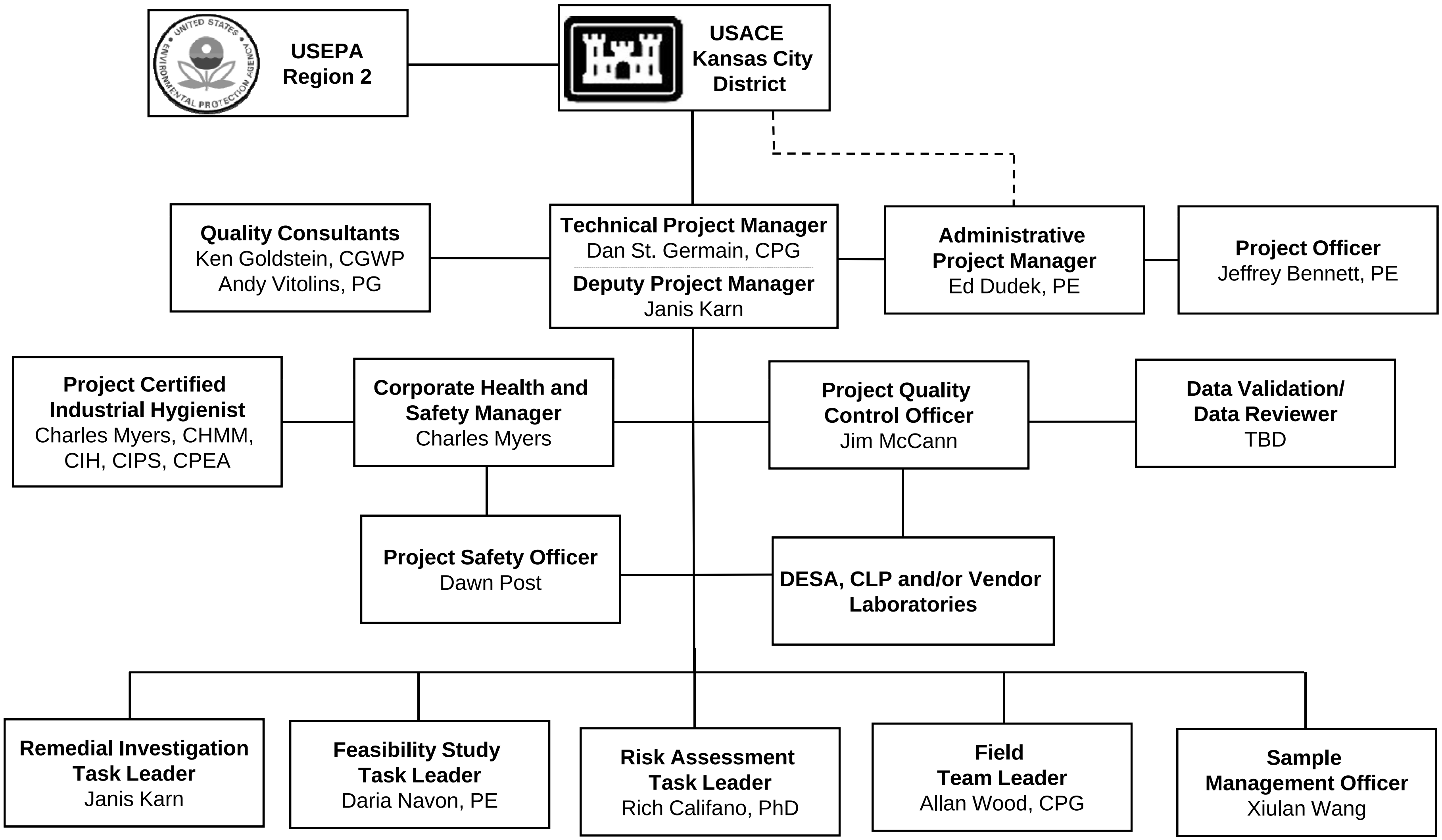
R2-0000406



MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site OU-3 Project Team Organization Chart	FIGURE 7-1